

Full control of your characterizations



ELECTROCHEMISTRY AND ELECTRICAL TESTING

Potentiostats & Galvanostats
Scanning Electrochemical systems
Solar Test Systems
Materials Test System
Lock-in Amplifiers

HTDS

Hi-Tech Detection Systems

HTDS offers a complete range of electrochemical instrumentation and materials characterization equipment solutions, as well as various complementary solutions in your sector (fundamental electrochemistry, renewable energy sources, corrosion, sensors, batteries, materials...), thanks to our providers (AMETEK Scientific Instruments & PalmSens).

With our local presence, we provide sales and installation, training and maintenance services for all the equipment offered in our catalog.

Focus on

A PERSONNALISED SUPPORT

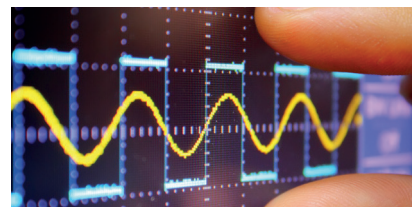
HTDS supports you at all stages of the implementation of your project:

- Writing /specification studies
- Technological proposal
 - Installation
 - Maintenance
 - Training

ELECTROCHEMISTRY: A WIDE RANGE OF APPLICATIONS

Fundamental electrochemistry

Fundamental research runs the gamut of electrochemical test cells and techniques, with experimental requirements continuously evolving. Flexible and customizable test equipment allows for a range of systems to fit the specific needs of each researcher.



Renewable energy sources

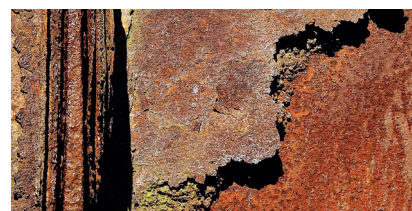
Energy Storage and Energy Conversion devices are both used to fill the need for portable as well as renewable power. Specific technologies are batteries, capacitors, fuel cells and solar cells. In commercial devices, these are often used in combination as part of a power system.



The evolving need requires the improvement in capability to provide pulse-power, long run-time and cycle life.

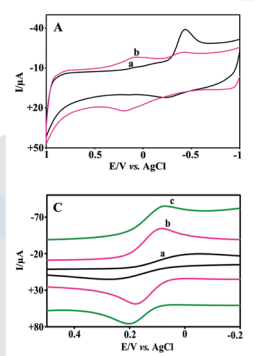
Corrosion

Corrosion affects the oil company that is pumping hot crude through miles of pipelines, the military that spends billions of Euros on ships and aircraft that spend their entire active life at sea, the civil engineer designing rebar support for the concrete in bridges, the automobile industry looking at the effects of road salts or galvanic couples, and the bio-material scientist developing medical stints and joint replacements that are implanted into people in hospitals every day. Corrosion is a real world problem, the effects of which should be considered any time a metal is put into service in a salty, humid environment.



Sensors/Nanotechnology

In the field of electrochemistry, nanotechnology has led to an entire new class of electrodes, from nanostructured carbons including nanotubes, nanofibers and graphene to 3D electrode arrays and nanopores. This new class of electrode materials has resulted in the development of nano-batteries that enhance conductivity and ion diffusion, in vivo nanosensors that exhibit improved sensitivity and nanofilms that reduce localized corrosion.



POTENTIOSTATS & GALVANOSTATS

PORTABLE INSTRUMENTS

HTDS offers a complete range of electrochemistry instrumentation and materials characterization equipment. The devices are general purpose potentiostat and are highly suitable for embedded use in all your applications.

We have different small USB and battery powered potentiostat: EmStat is available as single channel potentiostat but can also be combined with a multipotentiostat as a polypotentiostat, or as multichannel potentiostat.

EmStat3 and 3+ : the smallest potentiostat on the market

The EmStat 3 and 3+ powered potentiostats are the smallest research grade electrochemical interfaces available on the market.


 * Bluetooth and Android extension available

	EmStat 3	EmStat 3+
DC-potential range	± 3.000 V	± 4.000 V
Compliance voltage	± 5 V	± 8 V
Applied dc-potential résolution	$\leq 0,1$ mV	$\leq 0,125$ mV
Applied potential accuracy	$\leq 0,2$ % with max. 2mV offset error	$\leq 0,3$ % with max. 3mV offset error
Current range	1 nA to 10 mA (8 ranges)	1 nA to 100 mA (9 ranges)
Max measured current	± 15 mA minimum	± 100 mA typical

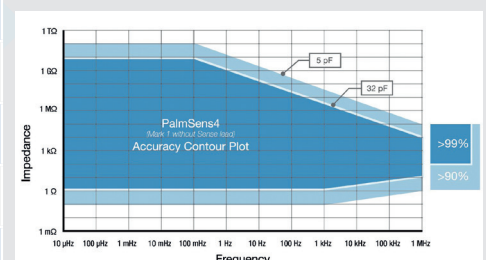


PalmSens 4 : the portable galvanostat & potentiostat

The PalmSens 4 is a USB and battery powered Potentiostat Galvanostat and an optional Frequency Response Analyser (FRA) for Electrochemical Impedance Spectroscopy (EIS). The PalmSens4 is available ± 5 V or ± 10 V DC-potential ranges and with two different maximum frequencies for FRA / EIS.

 * Bluetooth and Android extension available

	PalmSens 4
FRA / EIS	10 μ Hz up to 1 MHz
Current range	100 pA to 10mA (9 ranges)
Resolution	high resolution of 0,006% full scale range
Compliance voltage	± 5 V or ± 10 V potential range at 75 μ V resolution
Charge	USB and battery powered
Memory	always a backup of your data with 8GB of internal storage



SINGLE CHANNEL & BI POTENTIOSTAT INSTRUMENTS

POWERFUL AND PREMIUM INSTRUMENTS
IN A COMPACT CHASSIS



	PARSTAT 3000A	PARSTAT 3000A-DX	PARSTAT 4000A
Compliance Voltage	± 30V	± 30V(Chann.2), ± 12V(Chann.1)	± 48V
Polarization	± 30V	± 30V(Chann.2), ± 10V(Chann.1)	± 10V
Max Current Output	± 1A	± 1A(Chann.2), ± 2A(Chann.1)	± 4A
Min Current Range	± 4 nA (122fA resolution) down to ± 4pA (122aA)	± 4 nA (122fA resolution) down to ± 4pA (122aA)	± 40 pA (1,2fA resolution) down to ± fA (2aA)
EIS Max Frequency	7 MHz, Included	7 MHz, Included	10 MHz, Included
TTL output & Triggers	Supplied, BNC	Supplied, DB9	Supplied, DB9
Software	VersaStudio, Fully Enabled + VDK Developers Kit		

AFFORDABLE RESEARCH GRADE INSTRUMENTS



	VERSASTAT 3	VERSASTAT 3F	VERSASTAT 4
Compliance Voltage	±12V	±12V	±12V
Polarization	±10V	±10V	±10V
Max Current Output	±2A up to ±20A (with external Booster)	±2A up to ±20A (with external Booster)	±2A up to ±20A (with external Booster)
Min Current Range	±200 nA (6pA resolution) down to ± 4pA (122aA)	±4 nA (122fA resolution) down to ± 4pA (122aA)	down to ± 4pA (122aA)
EIS Max Frequency	1MHz, Option	1MHz, Option	1MHz, Option
TTL output & Triggers	Supplied, DB9	Supplied, DB9	Supplied, DB9
Software	VersaStudio + VDK Developers Kit		

MULTI-CHANNEL INSTRUMENTS

THE MULTI CHANNEL FULLY TAILORED TO YOUR BUDGET

Our multi-channel potentiostats are designed for the most demanding users who want quality and high productivity without compromising on cost. The MultiEmStat 3+ is a versatile multi-channel potentiostat with 4, 8 or 12 independent EmStat potentiostats. The channels can perform experiments independently of each other.

The MultiPalmSens4 is a flexible multi-channel potentiostat, galvanostat and impedance analyzer with four up to 10 channels.

- Corrosion
- Sensors
- Education
- Fundamental Electrochemistry
- Coatings



	MultiEmStat3+	MultiPalmSens4
Channels number	4, 8 or 12	4 to 10
Compliance Voltage	±8V	±5V , ±10V
Polarization	±4V	±5V , ±10V
Max Current Output	±100mA	±30 mA
Min Current Range	±1 nA (1pA resolution)	±1 nA (1pA resolution)
EIS Max Frequency	No EIS	100 KHz or 1MHz, Option
Software	MultiTrace	

THE ULTIMATE MULTI-CHANNEL INSTRUMENT

Multi-channel system is designed for the complete DC and impedance characterization of a wide range of energy storage devices such as batteries, fuel cells and super-capacitors. The speed, range and resolution of the our systems also make it suited to other research applications:

- Corrosion
- Batteries
- Sensors
- SuperCaps
- Fundamental Electrochemistry
- Coatings



	PMC 200	PMC 1000	PMC 2000A
Channels number max	20	10	10
Compliance Voltage	± 10V	± 12V	± 30V
Polarization	± 10V	± 10V	± 30V
Max Current Output	± 1A	± 2A	± 1A
Min Current Range	± 2 µA (238fA resolution)	± 4 nA (122fA resolution) down to ± 4pA (122aA)	± 4 nA (122fA resolution)
EIS Max Frequency	100 KHz, Included	1MHz, Option	7 MHz, Included
Software	VersaStudio + VDK Developers Kit		

BOOSTER OPTIONS

PMC Booster 5A Internal Booster -1 to 6V

PMC Booster 10A Internal Booster -1 to 6V

Parallel booster up to 20 A

SINGLE CHANNEL INSTRUMENTS

XM SERIES LABORATORY INSTRUMENTS

To ensure quality and accuracy of your measurements, even in extreme situations, HTDS offers a serie of instruments that guarantee you this standard.



	ModuLab XM ECS (4 or 8 slots)	EnergyLab XM	EchemLab XM
Polarization, Compliance Voltage	± 8V to ± 100V	± 8V	± 100V
Max Current Output	± 300mA up to ±100A	±2A up to ±100A	± 300mA up to ± 100A
Min Current Range	± 30 nA (1,5pA resolution) to ± 3pA (0,15 fA resolution)	± 30 nA (1,5pA resolution)	± 30 nA (1,5pA resolution)
FREQUENCY RESPONSE ANALYSER			
EIS Frequency range	10µHz to 1 MHz	10µHz to 1 MHz	10µHz to 1 MHz
Max sample rate	40MS/s	40MS/s	40MS/s
Frequency resolution	1 in 65,000,000	1 in 65,000,000	1 in 65,000,000
Frequency error	± 100 ppm	± 100 ppm	± 100 ppm
SIGNAL OUTPUT			
Waveform	Single Sine, Multi Sine	Single Sine, Multi Sine	Single Sine, Multi Sine
Single Sine	Linear/Log	Linear/Log	Linear/Log
Multi Sine/ Harmonic Frequencies	All or selected	All or selected	All or selected
ANALYSIS CHANNELS			
EIS Accuracy (ratio)	± 0,1%, ± 0,1	± 0,1%, ± 0,1	± 0,1%, ± 0,1
Analysis Channels	RE, WE, Aux A/B/C/D	RE, WE, Aux A/B/C/D	RE, WE, Aux A/B/C/D

SCANNING ELECTROCHEMICAL SYSTEMS

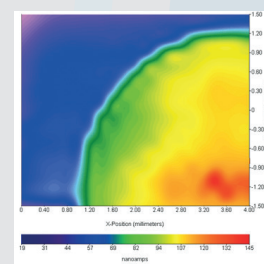
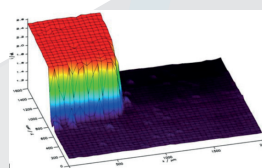
AN ADVANCED AND FLEXIBLE PLATFORM

In general way on electrochemical experiments, the electrode response to a perturbation signal corresponds to a surface-averaged measurement ascribable to the behaviour of the whole electrode surface. However, electrochemical systems rarely show an ideal behaviour, and this can lead to difficulties with data interpretation. Thanks to this localized electrochemical platform, we look beyond this homogeneity to study the spatial dependence of the electrode properties. To do so, our solution includes up to 9 localized measurement techniques.

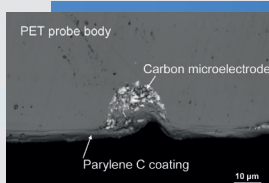
VersaSCAN

The VersaSCAN is a single platform capable of providing spatial resolution to both electrochemical and materials-based measurements. Potentiostats and Signal Recovery Lock-in Amplifiers are integrated via ethernet control to make accurate measurements of these small signals. Our platform offers 9 different techniques:

- Scanning Electrochemical Microscope System (SECM and ac-SECM)
- Constant Distance SECM (VS STYLUS)
- Scanning Vibrating Electrode Technique (SVET)
- Localized Electrochemical Impedance Spectroscopy (LEIS)
- Scanning Kelvin Probe (SKP)
- Scanning Droplet Cell (SDC and ac-SDC)
- Optical Surface Profiling (OSP)



	Scanning techniques	Information	Resolution	Applications
SECM	Scanning Electrochemical Microscopy	Electrochemical activity, sample topography, local surface conductivity	probe size	biological sensors, reaction kinetics, porous membrane studies, batteries, fuel cell catalyst evaluation, and corrosion mechanisms
ac-SECM	Alternating current Scanning Electrochemical Microscopy	Electrochemical activity, sample topography, local surface conductivity, local EIS	probe size	biological sensors, reaction kinetics, porous membrane studies, batteries, fuel cell catalyst evaluation, and corrosion mechanisms
STYLUS-SECM	Constant distance Scanning Electrochemical Microscopy	Soft contact with sample: with a contact force up to 1000 times less than hard probe technology (same information than SECM)	tens of μm	biological sensors, polymers sciences, reaction kinetics, porous membrane studies, batteries, fuel cell catalyst evaluation, and corrosion mechanisms
LEIS	Localised Electrochemical Impedance Spectroscopy	local EIS response of a sample	hundreds of μm	corrosion, coatings, catalysts
SKP	Scanning Kelvin Probe	Determine the relative work function difference between the probe and the sample / Topography	down to 10 μm	corrosion, coatings, catalysts
SVET	Scanning Vibrating Electrode Technique	Electrochemical activity	tens of μm	corrosion, coatings or biological process
SDC	Scanning Droplet Cell	Electrochemical techniques in a droplet	hundreds of μm	hundreds of μm
ac-SDC	alternating current Scanning Droplet Cell	alternating current Scanning Droplet Cell	hundreds of μm	corrosion, coatings
ac-SDC	Non-contact Optical Surface Profiler	topography of a sample	25nm (Z) 50 μm (X,Y)	any field complimentary to the above



THE STYLUS PROBE...

Unlike hard probe contact based techniques, the force of contact of a soft probe is low (approximately three orders of magnitude smaller than hard probe contact based techniques) and therefore is less likely to damage / alter the topography of the substrate during measurement. As such, this technology has successfully measured the activity of soft tissue from melanoma samples.

SOLAR TEST SYSTEMS

PHOTOELECTROCHEMISTRY

HTDS offers a range of products focused on solar cell / photovoltaic research (developed in collaboration with Professor Laurie Peter of the University of Bath, UK). These instruments are very versatile. They can be used for various photoelectrochemical applications like water splitting research , PV cells, including Perovskites, research, or PhotoElectrolyzers and PhotoBatteries ...

ModuLab XM

- Perovskite Solar Cells, DSSC's, Water Splitting Anode Development, IPCE (Incident Photon to Current Efficiency)
- Range of Frequency and Time Domain Measurement techniques including IMPS, IMVS, Impedance, PhotoVoltage Decay, Charge Extraction Techniques, I-V
- Auto' analysis of data enabled for calculation of effective Diffusion coefficients and Electron Lifetimes
- Modular chassis for extension to higher voltage, higher current, additional channels



SolarLab Xm

- Includes fully integrated optical bench
- Multiple techniques IMPS, IMVS, I-V, Charge extraction, PV decay with automated data analysis
- Wide bandwidth impedance and capacitance measurements
- IPCE available as an option
- Compact chassis for smaller footprint



Included Techniques	Measured parameters	Common specifications to both models	
IMPS	Effective Diffusion Coefficient of Electrons	Wavelength Range	300nm - 1100nm
IMVS	Effective Lifetime of Electrons	Intensity Range	6 Decades (With NO Filter)
Photo Voltage Decay	Effective Lifetime of Electrons	Maximum Beam Divergence	4 degrees
I-V	Fill Factor, Pmax, Voc, Isc, Efficiency	Maximum Beam Diameter/Cell Size	1 cm
Charge extraction-Dark	Trapped Charge Density	IMPS/ IMVS Transfer Function	Reference Photodetector
Charge extraction- Short Circuit	Trapped Charge Density	Calibration	NIST Traceable
IPCE Option	Quantum Efficiency	LED Driver Maximum Current	10 A
AC Measurement	Impedance/ Capacitance	Typical LED Stability at Max Power	< 2% Drift After 24 hours
		LED Driver Maximum Frequency	250 KHz

SYSTEMS MATERIALS TEST SYSTEMS

MATERIALS & IMPEDANCE ANALYZERS

HTDS provides integrated solutions that enable researchers to measure the combined electrical, thermal and mechanical properties of materials. Testing over a wide temperature range from -268 to >1200°C is simplified using PC software with integrated temperature control facilities.

ModuLab XM MTS

The ModuLab XM MTS can perform time domain (DC) and frequency domain (AC) tests. As with other ModuLab-platform systems it can be expanded for electrochemical or photoelectrochemical experiments.

- Widest impedance range - 10 μ hms to >100 Tohms
- Configurable for specific materials applications and expandable to electrochemical and photoelectrochemical experiments



MaterialsLab XM

The Materials Lab XM uses the same XM based platform to deliver ModuLab performance to a focused application, the study of materials. This focused design allows this instrument to occupy a small footprint.

- Application-focused on dielectrics, insulators, and electronic materials
- Impedance Range from 1 mOhm to 1 TOhm ($1E^{15}$ Range)
- Auxiliary measurement port for synchronized measurement of optical, mechanical or other transducers.



	Modulab XM MTS	Materials Lab
Maximum Frecency	1 MHz	1 MHz
Combines with DC for Electrochemical Measurements	Yes, with XM PSTAT 1MS/s	No
Highest Impedance	100 Tohms	1 Tohms
Lowest Impedance	10 μ Ohms	1 mOhms
Software	XM Studio	

SAMPLE HOLDERS

Combined with the XM series analyzers, remote controlled furnaces and cryostats with dedicated designed sample holders simplify testing of solids, liquids and powders. Materials can also be tested in controlled atmospheric conditions with the use of single or dual gases for fuel cell, solid oxide and super ionic conductor applications.

129610A LHe/LN2 Cryostat System

The 129610A cryostat may be used together with any Solartron materials test system to run I-V, Pulse, C-V, Impedance, Mott-Schottky and a wide range of other materials test techniques. It offers fully integrated temperature control.

- Cryogen not in contact with sample - prevents sample damage
- Temperature Range of 5 K to 600 K
- Compatible with both liquid helium (LHe) and liquid nitrogen (LN2)



KEY POINTS

- Very low cryogen consumption
- Capillary tube around sample space

129620A High Temperature Test System

An integrated system uses a split tube furnace design together with a lab jack that allows easy sample access and positioning. The sample is positioned in a purpose designed sample holder between platinum electrodes that allow testing at very high temperature. Key applications are: solid-state materials, included SOFC and solid-state batteries.

- Operating range room temperature to 950 K (1200°C)
- Various sample holder configurations are available depending on material requirements - 2 terminal/4 terminal/van der Pauw



KEY POINTS

- Dual gas supply is available for SOFC type applications
- Controlled atmospheres

12962A Room Temperature Sample Holders

The sample holder consists of two parallel electrodes, one of which is fixed in position and the other which can be moved into contact with the sample by adjustment of a micrometer.

- Electrode diameter of 20 mm standard. Options of 10 mm, 30 mm, 40 mm.
- Sample thickness range of 0.2 mm to 25.4 mm



KEY POINTS

- 2 terminal connections
- Sample types of solid, liquid, powder

129630 Micro Vacuum Probe Stations

As the "micro" name implies these probe stations are extremely small (140 mm / 5.5") and portable so you can easily move the test station from one experiment to the next.

- Peltier model 129630 PT/PTH (w -40°C to 200°C with light emission options)
- Ceramic model 129630 CHL/CHH (RT to 450° / 750°C)
- Liquid Nitrogen model 129630 LN2 (w 77K to 300K)



KEY POINTS

- testing ceramics
- polymers
- sensors
- solid state materials
- thin films

LOCK-IN & PREAMPLIFIERS

PROCESSING SIGNAL

Noise is inherent to every electronic assemblies. To be able to detect low signals, HTDS offers lock-in amplifiers to best meet your needs to remove noise from the raw signal. Our solutions can measure AC signals from a few nanovolts into a noise up to 100 000 times more intense.

Lock-in amplifier 7230

The 7230 offers a virtual front panel via a web browser which gives it a low profile for integrating into larger system configurations. This has been achieved by easy-to-use control panels that can be operated from any computer via your favorite browser. The 7230 offers the most versatility in any experiments configuration.

- Frequency range : from 1 mHz to 120kHz (up to 250kHz with option)
- Modes : A only, -B only or Differential (A-B)

Lock-in amplifier 7270

We have included unique features to our instruments such as dual reference and dual harmonic detection, which allow signals at two different frequencies to be measured simultaneously. The spectral display mode shows the power spectral density of the input signal, making it easy to avoid interfering signals when selecting a reference frequency.

- Frequency range : from 1 mHz to 250kHz
- Modes : A only, -B only or Differential (A-B)

Multi channel Lock-in amplifier 9210

The Model 9210 is a compact multichannel lock-in amplifier. It is ideally suited to make direct impedance measurements on samples such as superconductors or in material analysis, as well as for use in optical, calorimetric, AC susceptibility, and many other experiments.

- Recommended Frequency range DC - 100 kHz (operates from DC - 500 kHz)
- Two dual phase lock-ins per input channel, and two per signal generator output, operating at internal or external reference frequency or harmonic.
- Synchronous X, Y, R and outputs for each lock-in, and DC measurement

Low Noise Current Amplifier 5402

The Model 5402 is a low noise current input preamplifier designed for use whenever the signal source is a current source. The gain (transimpedance) is switch selectable with six settings enabling the amplifier, on its most sensitive range, to detect fractions of a picoamp without noise degradation.

- Low input impedance
- Low noise
- Single-ended virtual ground input
- Six gain settings
- DC to > 4 MHz frequency response
- Internal rechargeable batteries



OUR INTERNATIONAL NETWORKS

HTDS (Hi-Tech Detection Systems) is a company specialized in the distribution and maintenance of high-tech detection systems in France and abroad.

HTDS offers a full range of detection solutions dedicated to the following areas:
Electrochemistry and electrical test - Security - Product Inspection - Analytical Sciences -
Nuclear and Radiation Protection - Optoelectronics

HTDS's exclusive partners for electrochemistry are recognized as world leaders in their field.



A large white rectangular area containing ten horizontal lines, intended for contact information or additional details.

HTDS offers its products in France and abroad (Algeria, Egypt, DRC, Madagascar, Libya, Morocco, Tunisia)

www.htds.fr



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