

# Electrochemistry



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Solartron Analytical designs and manufactures instrumentation for the rapid and accurate measurement of electrochemical phenomena. Covering dc and ac electrochemical analysis, our product range includes a variety of potentiostats / galvanostats, impedance analyzers, multiplexers, multistats, and application specific software, ZPlot / CorrWare. These tools are important in numerous applications including coatings analysis, gas sensor development and biomedical research.

Solartron potentiostats feature two digital voltmeters with high accuracy and linearity throughout the instrumental range for simultaneous voltage and current measurement. They also offer, 2-, 3-, 4-terminal measurement, driven shield technology for minimizing cable impedance effects and floating measurements for grounded structures, such as pipelines and autoclaves. A diverse range of techniques can be used including; cyclic voltammetry, electrochemical noise, step/pulse, galvanodynamic, potentiodynamic, and open circuit.

## 1480 MultiStat

The 1480 MultiStat represents the next generation of high performance dc/ac analysis technology, offering the user an independent multichannel capability for electrochemistry, with upto 32 channels operating from one computer.

A full range of standard electrochemical test routines are available including:-

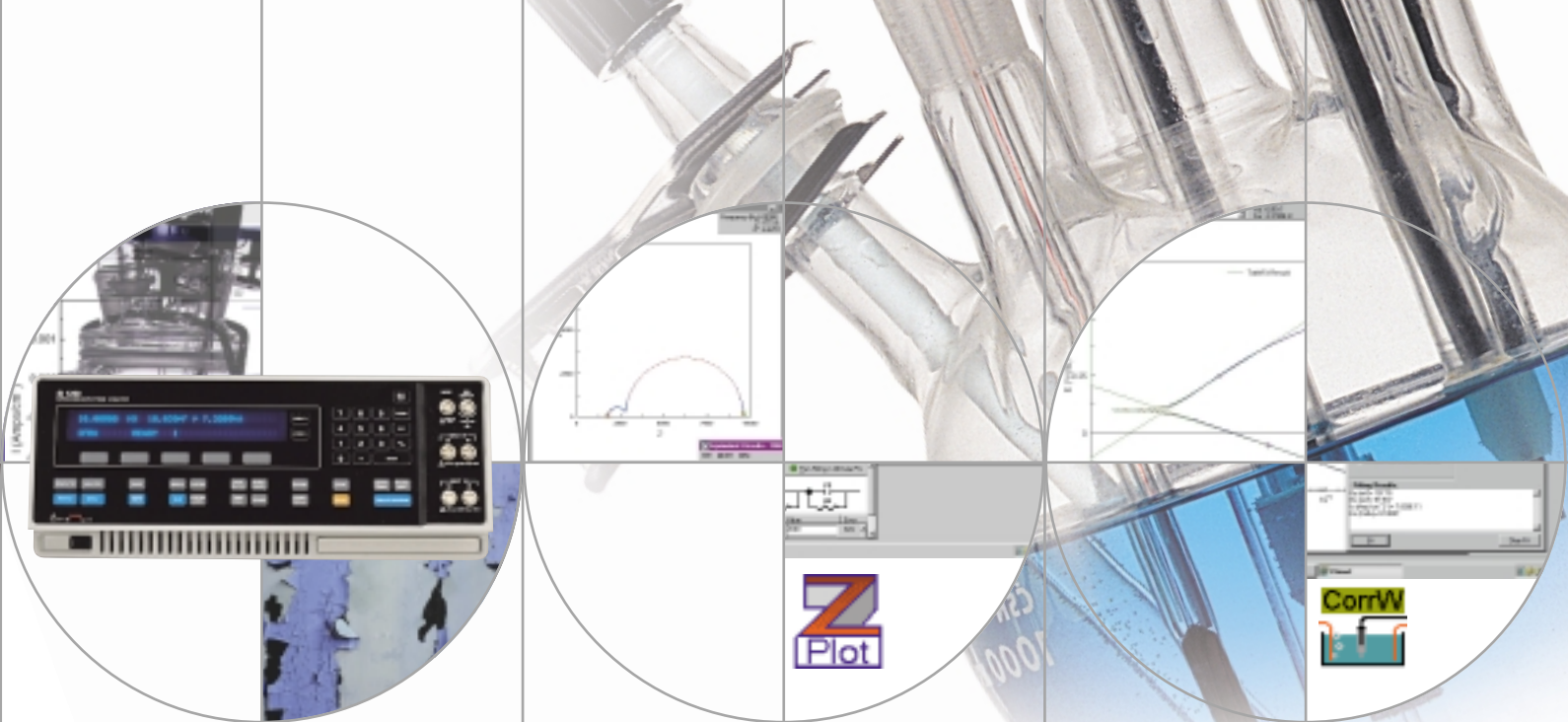
- Constant voltage, current, power and load test strategies
- Maximum applied levels: +10V, -3V and  $\pm 4A$  per channel
- Resolution:  $3\mu V / 1.5nA$
- High speed data acquisition at 10,000 samples / sec
- Built-in multiplexer to enable impedance studies to 1MHz on any of the eight channels using 1260 / 1255 Frequency Response Analyzers (FRAs)

## 1287 Electrochemical Interface

The 1287 Electrochemical Interface has high measurement resolution down to  $1\mu V$  for the reference electrodes and  $1pA$  for the working electrode. Coupled with a Solartron FRA, such as the 1260 or 1255, Electrochemical Impedance Spectroscopy (EIS) measurements can be performed over a full  $10\mu Hz$  to 1MHz frequency range.

- True 1MHz measurement bandwidth - ideal for both dc and EIS measurements (when used with a Frequency Response Analyzer such as 1260 / 1255).
- Full range of standard electrochemical techniques available, including cyclic voltammetry, step and pulse analysis, impedance etc.
- 2-, 3- and 4-terminal measurement capability
- Maximum applied levels:  $\pm 2A / \pm 14.5V$
- Resolution:  $1pA / 1\mu V$
- Floating electrodes for measurement on grounded structures ie. pipelines, autoclaves etc.





## EIS Electrochemical Impedance Spectroscopy

EIS is a powerful technique which uses ac polarization signals to determine impedance, normally over a range of frequencies.

Impedance measurements - which in most cases have little or no effect on the phenomenon studied - are a sensitive indicator of a wide variety of chemical and physical properties. They are used to provide valuable insight in hundreds of applications ranging from the analysis of organic coatings and corrosion inhibitor studies to research into sensors, batteries, fuel cells, and general materials characterization.

### Components of an EIS System

1 Electrochemical Interface (ECI), a potentiostat/galvanostat capable of handling polarization and measurements up to the maximum frequency required.

2 Frequency Response Analyzer (1260/1255), to generate and measure the ac signals.

*Computer and software for controlling the ECI and FRA.*



## 1260 Impedance / gain-phase Analyzer

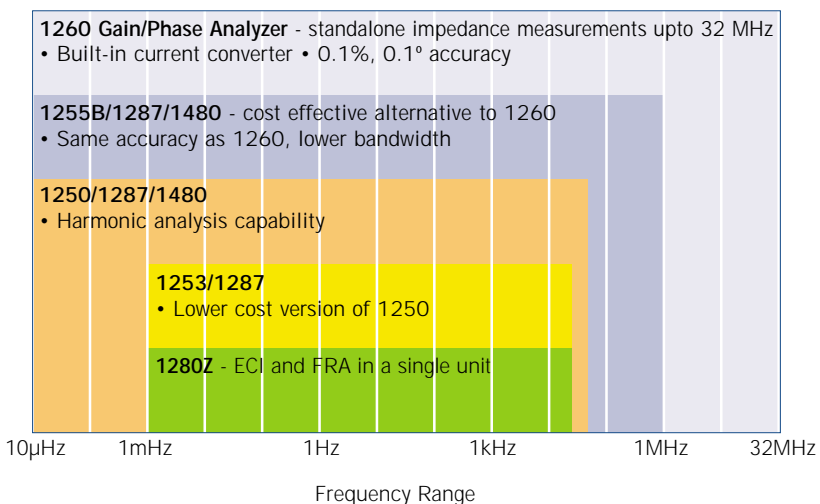
1260 uses Solartron's patented measurement technology, which inherently removes the noise and harmonic distortion which plagues lesser instruments.

- Frequency resolution: 1 in 65 million (0.015ppm)
- Stand alone frequency range 10 $\mu$ Hz to 32MHz
- 0.1%, 0.1 $^\circ$  accuracy - unsurpassed by any similar instrument
- Resolution to 0.001dB, 0.01 $^\circ$  - capturing every detail
- Measures impedances >100M $\Omega$
- 2, 3 and 4-terminal measurement configurations
- Polarization voltage up to  $\pm$ 40.95V
- Renowned ZPlot software package simplifies experiments and optimises throughput

## 1255A/B Frequency Response Analyzer

The 1255 series Frequency Response Analyzers enable precise measurement of gain and phase between any two points in a system; or even impedance when coupled to a 1287 or 1480.

- Measures gain, phase and group delay
- 0.2%, 0.2 $^\circ$  accuracy
- Deep dynamic range: 130dB with auto ranging
- Wide frequency range: 10 $\mu$ Hz to 20MHz with 1255A
- 1255B blank front panel version frequency limited to 1MHz
- Automatic sweeps of frequency, amplitude or dc bias
- Automatic rejection of noise and harmonics



## 1280Z Electrochemical Test System

The Solartron 1280Z Electrochemical Test System offers a high accuracy, wide bandwidth potentiostat/galvanostat and a frequency response analyzer in a single compact unit.

- Fully floating 2-, 3-, 4-terminal measurements
- Unrivalled resolution: 1pA, 1 $\mu$ V
- $\pm 14.5V$ ,  $\pm 2A$  polarization
- Frequency range from 1mHz to 20kHz

## 1285 DC Potentiostat

For a complete, cost effective package for dc measurement, the 1285 system cannot be beaten. Combining Solartron's superb measurement hardware with the highly respected CorrWare for Windows software package running on a standard PC, a comprehensive spectrum of dc techniques is made available.

## 1281 Multiplexer

Computer controlled multiplexer with 8 channels for use with a laboratory potentiostat/galvanostat such as 1287/1285/1280 etc. Enables high performance multichannel testing and automated monitoring.

## 1284 Potentiostat

Entry level potentiostat/galvanostat offering excellent performance at a competitive price, ideal for educational purposes.

## Software for Electrochemistry

### CorrWare for Windows

CorrWare is the most comprehensive software package available for dc electrochemistry, allowing you to set up and control experiments such as cyclic voltammetry, potentiodynamic scans, chronoamperometry etc.

### ZPlot for Windows

Windows based software for total experimental control and data manipulation for all EIS research applications, including equivalent circuit modelling facility based on the LEVM package.



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**Solartron Analytical** is a world leader in instrumentation and software for the characterization of materials and electrochemical systems using precision electrical measurement techniques.

These techniques find particular use in the fields of corrosion, battery and fuel cell research, dielectric analysis and electrochemistry. The product portfolio includes industry standard frequency response analyzers, potentiostats, electrochemical software (Zplot and CorrWare) and battery test equipment.

Arun Technology, an operating unit of Solartron Analytical, provides a range of metal analyzers using optical emission techniques for determining elemental content. The units in static laboratory or mobile format are used in foundries, steelworks, or scrapyards for metals analysis or material identification.



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