

# Smart Probe™

AUTOMATED LANGMUIR PROBE PLASMA DIAGNOSTIC



The number one  
Langmuir Probe for  
Accuracy, Reliability  
and Performance

# Smart Probe™

AUTOMATED LANGMUIR PROBE PLASMA DIAGNOSTIC

## Features for World's Leading Commercial Langmuir Probe

SmartProbe™ from Scientific Systems is the world's leading commercial Langmuir probe system and is used to measure a wide range of plasma parameters such as plasma density, uniformity and electron temperature distribution. Regarded as the standard instrument for plasma researchers, it enables them to completely understand the complexity and characteristics of a plasma and how they relate to the plasma process they are trying to develop.

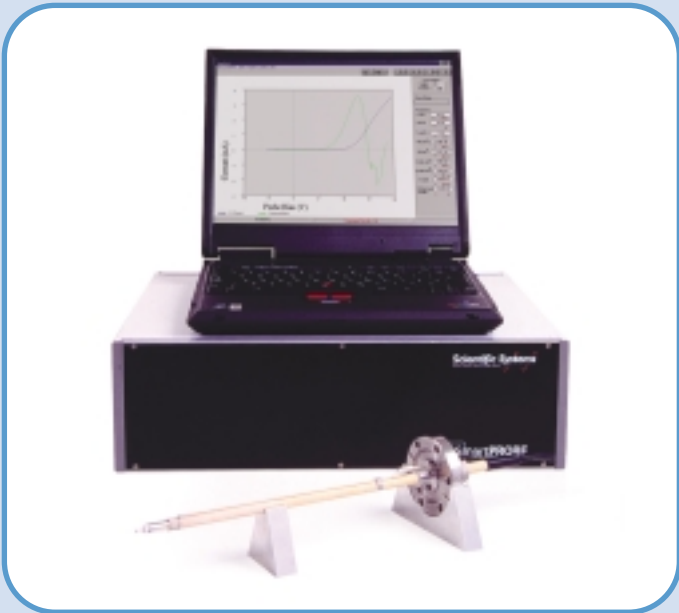
Plasmas are used by the semi-conductor and thin film industries to etch features, deposit layers and modify surfaces.

Key to the development of a new etch or deposition process is the understanding of the internal plasma parameters as measured by the SmartProbe™. Measurement of these critical parameters helps minimize development time and optimize the plasma process for the desired application.

What makes SmartProbe™ the market leader in the sector is that it gives researchers rapid and accurate characterization of the process plasma.

Added to this, is the fact that it has several hundred customers world-wide across both the industrial and research communities.

SmartSoft™, the software application that comes packaged with SmartProbe™, is a powerful Microsoft Windows compatible software package that provides immediate data acquisition and analysis. Scientific Systems has a team of experts with a strong background in plasma measurement and research that is available at all times to customers and users of the tool.



## Features and Benefits

An updated version of SmartProbe™ has recently been launched and includes several new features. The SmartProbe™ can now be controlled via a laptop, as well as a desktop PC, and works with Microsoft Windows operating systems Windows 2000, NT, 98, and 95.

Scientific Systems has also increased the speed at which the SmartProbe™ is triggered by a factor of five. Previously, the external trigger was 18 kilohertz (kHz), but this now stands at greater than 100 kHz. The SmartProbe™ also now includes an internal delay generator which enables the user to perform fully automated time resolved measurements in pulsed plasma systems.

### FEATURES OF SMARTPROBE™

- Complete Characterization of Plasma Parameters in DC, RF, Microwave and Pulsed Plasmas
- Automated Drive System for Spatial Measurements
- Broadband RF Compensation\*
- SmartSoft™ Software
- Automated probe clean feature
- Boxcar Mode for Time Resolved Measurements with Internal delay generator.
- RS232 Communication
- External trigger rate greater than 100 kHz
- Reference Electrode

### BENEFITS OF SMARTPROBE™

- Facilitates optimization of plasma sources/plasma processes
- Optimization of plasma source uniformity
- User-friendly software compatible with any MS Windows operating system
- Extremely portable, works via lap-tops
- Reduction in plasma process development time
- Compatible with multiple or variable frequency plasma systems

\*New feature: for more information see contact details overleaf.

## Application Data

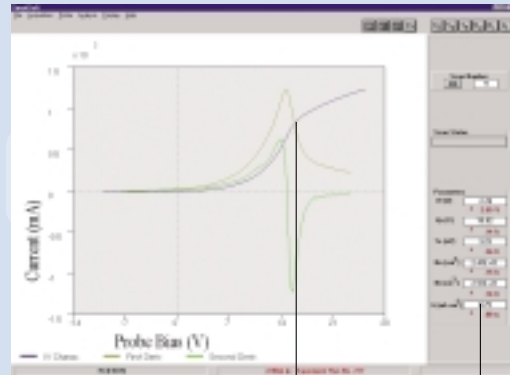
Spatial profile measured in a Commercial Inductively Coupled Plasma (ICP) Etch System



200mm Wafer Centre

Visual Display Buttons, simple click operation generates spatial or temporal profiles of the plasma parameters

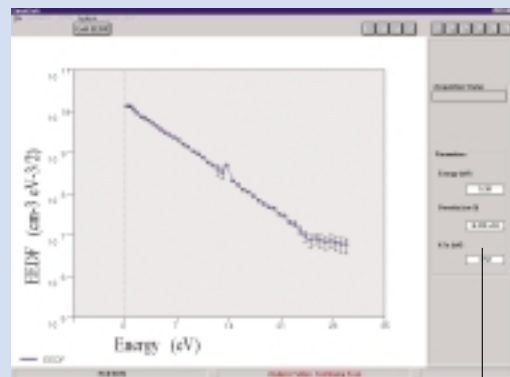
I-V characteristic using the reference probe in a GEC reference cell, Chlorine Plasma



First and second derivatives shown

Real time display of plasma parameters

EEDF measured in a GEC reference cell



The eedf yields information on the electron energies and electron temperature of the plasma

# Specifications

## Measured Plasma Parameters

- ion & electron densities over the range  $5 \times 10^8$  -  $5 \times 10^{12} \text{cm}^{-3}$  @ 13.56MHz
- electron temperature over the range 0.04 to 10eV
- plasma potential
- floating potential
- ion flux
- EEDF over five orders of magnitude

## Acquisition Electronics

case	standard 19" rack mount (3U) case
sampling	synchronous measurement of probe voltage, probe current & reference voltage
sampling rate	100,000 samples per second
resolution	probe voltage 25mV probe current 0.1 $\mu$ A reference voltage 25mV
probe voltage scan range	$\pm 95\text{V}$
current range	0.25 mA to 250mA (@ 13.56MHz) auto current ranging system, optional 2A version available
ext. trigger	opto-isolated input, TTL edge triggered for boxcar operation
boxcar mode	resolution 1 $\mu$ s modulation rate up to 1 MHz max. ext. trigger rate 100 kHz
Internal Delay Generator	Range 0 to 13000 $\mu$ s Jitter +/-100nS Resolution 200nS

## Langmuir Probe

blocking impedance	>100K $\Omega$ @13.56MHz, other frequencies available
compensation electrode	area: 3.5cm <sup>2</sup> shunt capacitance: 50pF
shaft material	alumina
shaft length	470mm flange to tip, custom lengths available
tip material	tungsten, non-standard tips available
tip length	10mm
tip radius	0.19mm
air cooling	inbuilt air inlet for probe tip cooling

## Minimum PC Requirements

PC/laptop	Pentium™ 166MHz or higher
memory	16 MB RAM
monitor	Super VGA Colour 1024 x 768
software	MS Windows™ 95/98/NT/2000

## Reference Probe

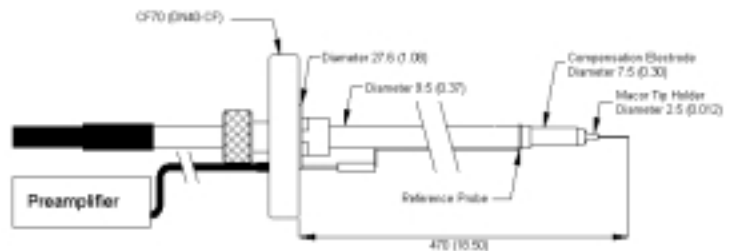
preamplifier	input impedance: 10 <sup>9</sup> $\Omega$ input capacitance: 6pF
material	tungsten, non standard materials available

## Auto Linear Drive

stroke	300mm, 500mm, 800mm
max speed	40mm/sec
accuracy	$\pm 1\text{mm}$

## Dimensions: mm (inches)

### Langmuir Probe



### Auto Linear Drive



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Scientific Systems is a leading designer and manufacturer of sensors and instruments for plasma process control and measurement. The company's Power and Impedance monitors, Ion flux probe and advanced Langmuir probe are used worldwide by plasma research laboratories and plasma based manufacturing industries including the semiconductor and thin film coating industry sectors. Scientific Systems has its Headquarters in Dublin, Ireland and has sales and support offices in Europe, Singapore, the US and Japan. Scientific Systems can be found on-line at [www.scisys.com](http://www.scisys.com).

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