

# SEMION | SYSTEM

Ion Energy, Ion Flux and Uniformity Analysis

World leading *Retarding Field Energy Analyser (RFEA)* technology



## Measures

- Ion Energy Distribution
- Ion flux
- Positive/negative ion/electron analysis
- Average Ion Energy
- Electrode Voltage (Vdc)
- Uniformity\*

## Functionality

- Time averaged
- Time resolved\*\*
- Time trend

## Features

- Up to 13 measurement points
- Replaceable button probe sensors
- Custom sensor holder plates
- Fully automated software
- USB 2.0 as standard

\*Semion Multi only

\*\*Limited applications

The Semion *Retarding Field Energy Analyser (RFEA)* system measures the uniformity of ion energies hitting a surface using an array of integrated sensors.

The Semion Multi Sensor is primarily used for researching wafer uniformity in industrial plasma applications, but it also finds applications in research. Users in the semiconductor community are concerned with the uniformity of ion interactions with the substrate and this holds true for coatings, etching, plasma sputtering, PECVD and ion beam applications.

With ever increasing substrate sizes, plasma uniformity becomes increasingly critical. The Semion Multi Sensor saves time and confirms plasma uniformity models, which is essential in the development of plasma tools and for materials research.

Note: Time resolved functionality can be used when the plasma is pulsed and the Semion Sensor is mounted on a grounded or floating electrode.

### Measuring Parameters (Range)

Ion Energy	2000 - $V_{dc}$ (eV)
Ion Flux Range*	
Low	0.001 to 3 ( $A\ m^{-2}$ )
Standard	0.01 to 50 ( $A\ m^{-2}$ )
High	0.1 to 700 ( $A\ m^{-2}$ )
IEDF Resolution	$\pm 1$ eV nominal

\*Choice dependent on plasma density

### Probe Bias Conditions

Max RF Bias Voltage	1 kV (peak-to-peak)
Max DC Bias Voltage	-1940 V
Bias Frequency Range (Time Averaged Measurements)	100 kHz to 80 MHz
Bias Frequency Range (Time Resolved Measurements)	0 Hz to 100 kHz
Time Resolution*	100 $\mu s$

\*For pulsed plasmas with Semion mounted on grounded or floating electrode

### RFEA Probe

Number of Sensors (Button probes)	1 to 13
Probe Configuration	4-grid
RFEA Button Probe Diameter	33 mm
Holder Plate Diameter	50mm to 450mm, custom available on request
Holder Thickness	5 mm
Maximum Operating Temperature	200° C
Mounting	RFEA Holder Plate mounted on electrode
Button Probe and Holder Plate Material	Aluminium or anodized Aluminium, stainless steel and ceramic ( $Al_2O_3$ ) on request
RFEA Holder Plate Assembly Cable Length	650 mm standard, custom on request

### Feed-through Assembly

Flange Type	CF40 standard, custom on request
-------------	----------------------------------

### Semion Control Unit Electronics

Grid Voltage Range	-2 kV to 2kV
Current Range	-1 mA to +1 mA
Connectivity	USB 2.0
SYNC Signal Specification	TTL (0 V to 5 V Square Wave)

### Application Software

Operating System	Windows 200   XP   Vista   Windows 7   Windows 8
------------------	---

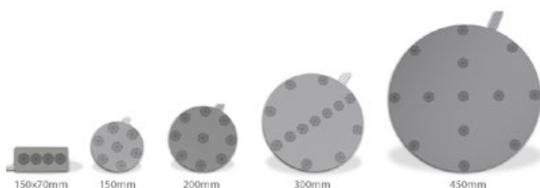
### Operating Parameters

Pressure (Pascal   Torr)	0.1 to 40 Pa   0 to 300 mTorr*
Density Ranges (Ar at 3 eV):	
Low	$1.2 \times 10^{12}$ to $7.4 \times 10^{15}$
Standard	$2.0 \times 10^{13}$ to $1.2 \times 10^{17}$
High	$2.7 \times 10^{14}$ to $1.6 \times 10^{18}$

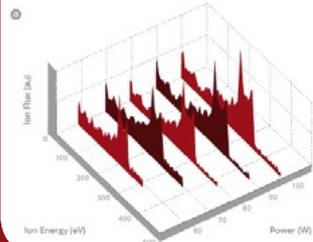
\*dependent on ion mean free path

## RFEA Holder Plate Assembly

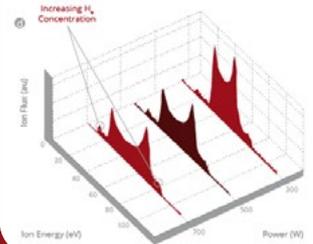
The Holder Plate Assembly can be mounted on a grounded or biased electrode and is used to hold the replaceable button probe sensor. The holder is available in a number of materials including aluminium, anodised aluminium and stainless steel with custom materials available.



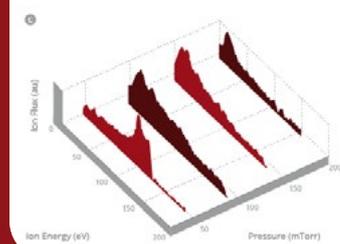
### Ion Energy as a Function of Power



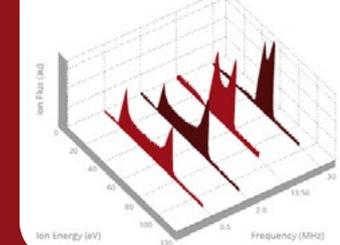
### Ion Energy as a Function of Chemistry



### Ion Energy as a Function of Pressure



### Ion Energy as a Function of Frequency



### Contour Map

