

# Semion™ 3 keV System






Retarding Field Energy Analyser (RFEA)








## IEDF Measurement System

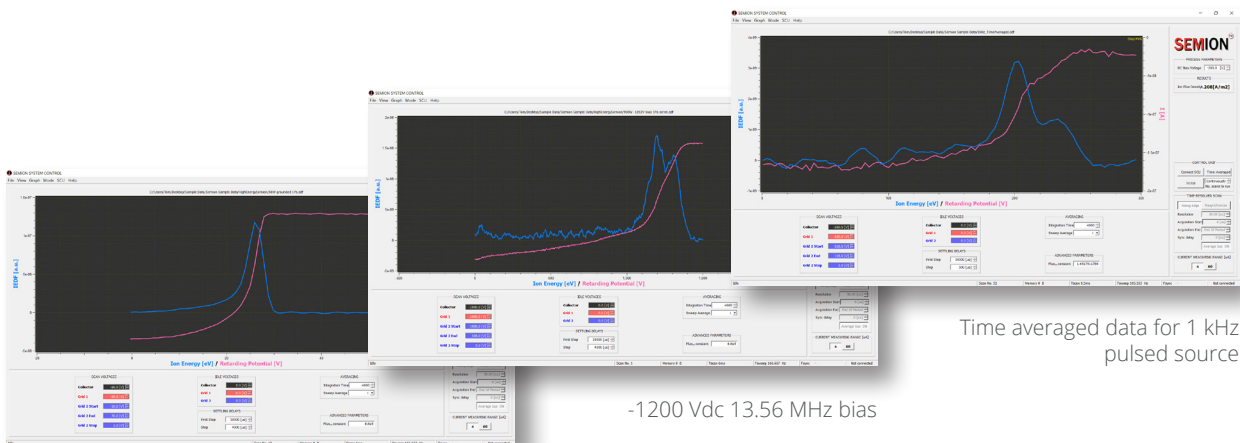
The Semion 3 keV System is a new Retarding Field Energy Analyser (RFEA) from Impedans Ltd which extends the range of the Semion sensor platform. It can measure the ion flux and ion energy distribution function in real time with up to 3 kV peak-peak RF bias voltage applied, three times what the standard Semion system can achieve. The sensor consists of a anodized aluminium wafer (as standard) with a single sensing element placed where the substrate would normally sit. The sensing element can have various current sensitivities depending on the expected plasma density, covering the full range of plasma applications. The Semion 3 keV System is the ideal sensor for rapid plasma characterization, based on the industry standard ion energy measurement platform, which has over 100 publications to date.

### Key Features

-  Measure the Ion Flux and Ion Energy Distribution with energy range up to 3000 eV (process dependant).
-  Suitable for grounded, floating and RF biased conditions.
-  Fully automated software analysis including IEDF adjustment for sensor DC bias potential.
-  Replaceable sensor elements with different sensitivities ranging from 0.001 Am<sup>-2</sup> to 700 Am<sup>-2</sup>.
-  Sensor elements and holder available in anodised aluminium, bare aluminium or stainless steel options.

### Key Benefits & Applications

-  Portable system allowing analysis in multiple chambers using a single system.
-  Provides in-situ measurement of Ion Energy Distribution (IED) under plasma processing conditions.
-  Provides insight for fundamental research and for plasma model validation.
-  Generate process data for customer escalations or product marketing.
-  Correlate process performance with the key plasma process drivers (ion energy and ion flux).



Time averaged data for 1 kHz pulsed source

Grounded scan in Argon

## Electronic Control Unit Specifications

# Voltage channels	3
Voltage range	-1500 V to +1500 V
Current range	100 pA to 60 $\mu$ A
Connectivity	USB 2.0
Synchronization	TTL Input

## RFEA Probe Specifications

Number of Sensors (Button Probes)	1
Probe configuration	4-grid
Button Probe diameter (sensing element)	33 mm
Holder diameter	50 – 450 mm diameter options (custom available)
Holder thickness	5 mm
Max. operating temperature	150° C
Button Probe material	Aluminium, anodised aluminium, stainless steel, ceramic
Holder material	Aluminium, anodised aluminium, stainless steel, ceramic
RFEA Probe cable length	650 mm (custom available)
Flange Type	CF40 as standard, apaptors provided

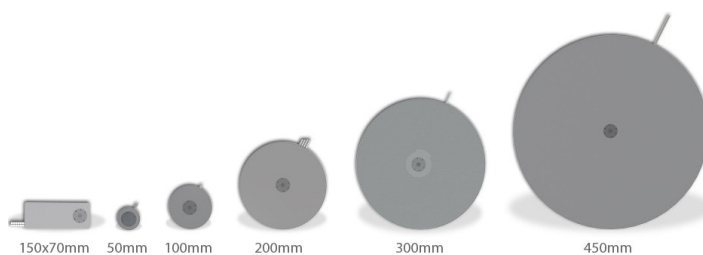
## Semion System Specifications

Ion Energy Range	Up to 3000 eV
Ion Flux	0.001 to 3 Am <sup>-2</sup> (low density Button Probe) 0.01 to 50 Am <sup>-2</sup> (standard Button Probe) 0.1 to 700 Am <sup>-2</sup> (high density Button Probe)
Pressure Range	$\leq$ 300 mTorr (standard Button Probe)
IETF Resolution	$\pm$ 1 eV nominal
Ion Density Range	10 <sup>12</sup> to 10 <sup>18</sup> m <sup>-3</sup> (Button Probe dependant)
Max. RF Bias Voltage (applied to probe)	3 kV (peak to peak)
Max. DC Bias Voltage	-1500 V
Bias Frequency Range	400 kHz to 100 MHz
Sync Frequency Range (Time Resolved)*	4 Hz to 100 kHz
Time Resolved Method*	Boxcar integration
Time Resolution*	5 $\mu$ s

\*for pulsed plasmas with Semion mounted on grounded or floating electrode. Custom feedthrough is required.

## 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(s). The holder is available in a number of materials including aluminium, anodised aluminium and stainless steel with custom materials also available.



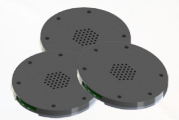
Publication list available at: [impedans.com/semion-publications](http://impedans.com/semion-publications)



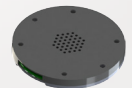
Electronic box



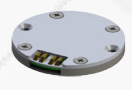
Feedthrough with single sensor holder



Button Probes



Button Probe - front side



Button Probe - back side