

Hidden ESPION series electrostatic plasma probes
Advanced Langmuir probes for plasma diagnostics

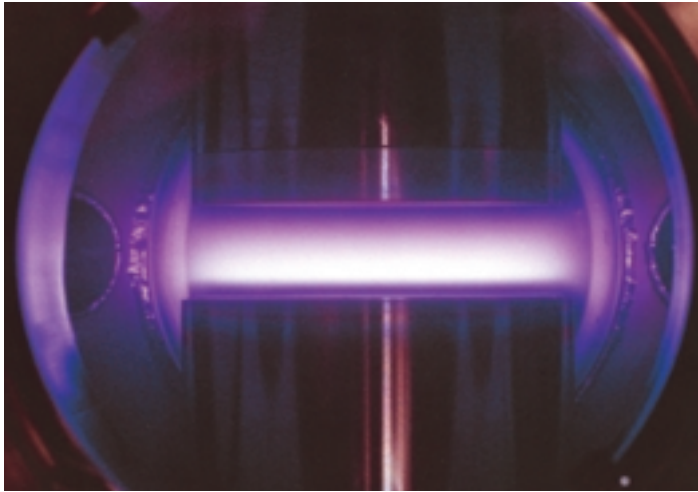


vacuum analysis

surface science

plasma diagnostics

gas analysis



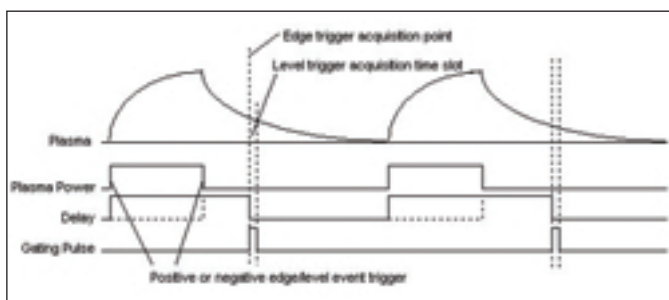
versatility

ESPION from Hiden Analytical is the world's fastest, most versatile commercial electrostatic Langmuir probe. Critical plasma parameters such as

- ion & electron density
- electron temperature distribution
- plasma uniformity

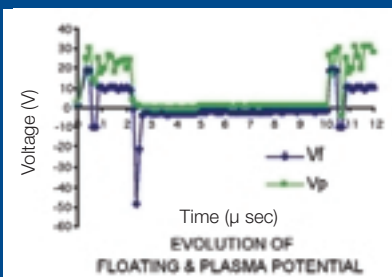
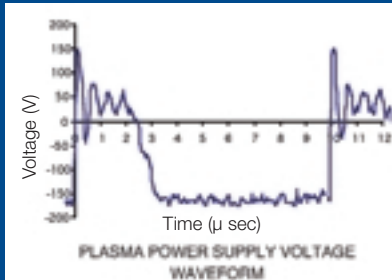
are automatically measured and reported, providing rapid and accurate feedback essential for plasma based materials processing.

It is packed with industry first features, such as software controlled timing circuitry for temporal measurements in pulsed plasmas, which make it the instrument of choice for industrial and academic research.

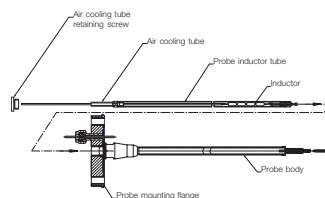


on-board timing circuitry

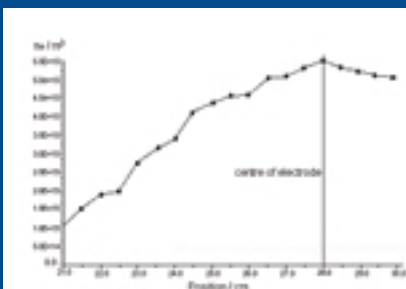
ESPION technology...at a glance



sub-microsecond resolution



user replaceable inductors



plasma uniformity across RF electrode

pulsed plasmas

Pulsed plasmas can offer several benefits over continuous wave plasmas for a variety of processes. By varying pulse frequency, pulse duration and bias voltage, film growth and film properties can be tailored. Knowledge of the way in which plasma parameters vary over the pulse cycle is therefore extremely useful and can help to define optimum operating parameters for a particular process.

Hidden Analytical were the first to introduce on-board, software controlled timing circuitry in direct response to this growing area and at 62.5nsec, the ESPION has more than x10 the resolution of other commercial Langmuir probes. The data on the left shows sub-microsecond time evolution of plasma parameters from a 50mTorr hollow cathode discharge pulsed at 100kHz (2μsec reverse time). This level of detail is lost with probes of lower resolution.

variable frequency plasmas

The frequency of the driving RF power can have a significant effect on the molecular fragmentation within a plasma. This in turn can lead to different plasma-induced surface chemistries. The ESPION is designed so that customers can quickly and easily match the RF blocking inductors to different frequency plasmas.

plasma uniformity

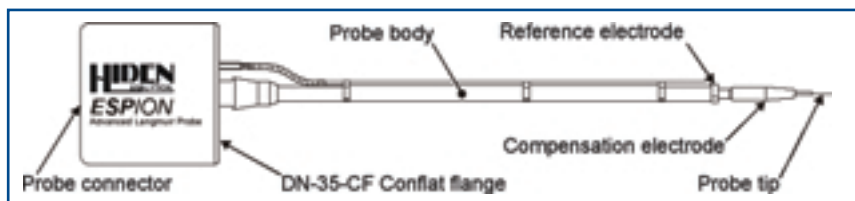
The plot opposite shows the electron density profile measured across the RF driven electrode of a 10W, 40mTorr Argon plasma. Measurements at each probe position are performed and analysed automatically and plotted in real time as the z-shift probe is stepped through the position sequence.



ESPION technical specifications

measured plasma parameters

ion and electron density over the range
 $10^{14} - 10^{19} \text{ m}^{-3}$
electron temperature up to 10 eV
EEDF
plasma potential
floating potential
ion flux



control system

voltage range	-200V to +100V
current range	20 μ A to 1A
	auto ranging
resolution	12 bits
fastest sample time	15 scans/s
acquisition speed	69,000 points/s
acquisition system bandwidth	1MHz

on-board timing resolution for pulsed plasmas

edge or level triggered	
trigger edge resolution	62.5 nanosecond
max. trigger pulse frequency	3 MHz

PC comms

Comms	RS232 / 10 base 2 LAN
OS	Windows™ 98/NT/2000/XP

automatic z - translators

stroke	300mm, 600mm, 915mm
speed	12.7mm/s standard (25.0mm/s option)

dimensions

tip length	10mm
tip diameter	0.15mm
probe diameter	8.0mm
insertion length	316.5mm (other lengths available)
mounting flange	DN-35-CF
interface module	19" rack mounting (2U)
power requirements	110-240 VAC, 50/60 Hz, 1.0 kVA

probe construction

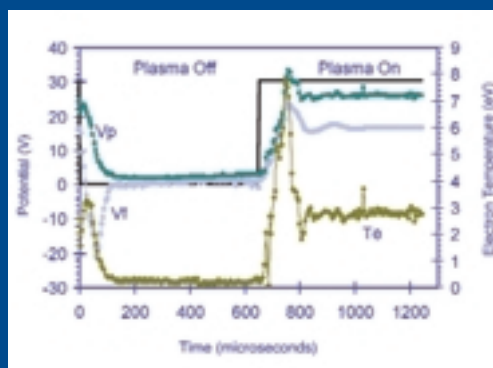
body	alumina
compensation electrode	hard anodised aluminum
tip material	tungsten (others on request)
reference electrode	stainless steel
air cooling	inbuilt push fit connection

confidence

ESPION has been developed and tested in collaboration with some of the world's leading plasma scientists and is the only Langmuir probe to be endorsed by Prof. Francis F. Chen of UCLA.

Prof. Chen says of the Hiden ESPION, "with its high speed, elegant software, and reference electrode, is close to an ideal system for electrostatic probe measurements..."

ESPION is backed by Hiden's 20+ years of manufacturing experience of plasma measurement equipment and has the lowest cost of ownership of any plasma diagnostic technique. Our customers have fast and reliable access to a worldwide network of service engineers and support scientists with expert knowledge of plasma diagnostics and processing.



ESPION



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It is Hiden Analytical's policy to continually improve product performance
and therefore specifications are subject to change.

TECHNICAL DATA SHEET 152