

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

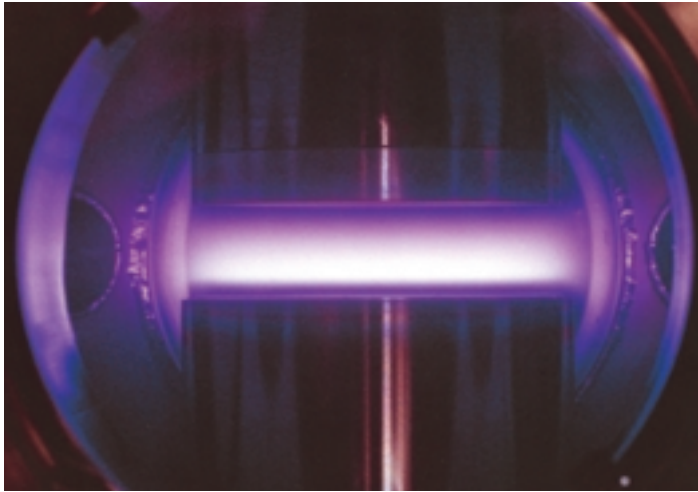


vacuum analysis

surface science

plasma diagnostics

gas analysis



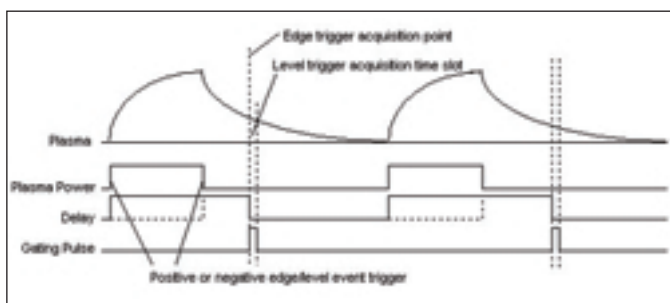
versatility

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

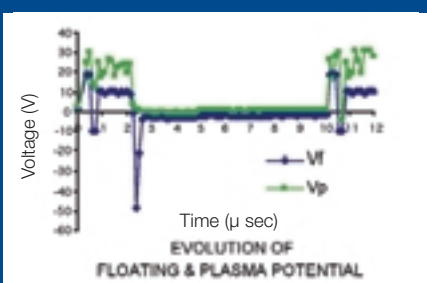
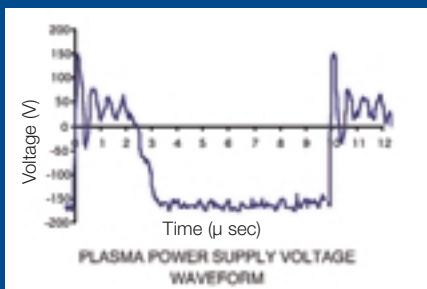
are automatically measured and reported, providing rapid and accurate feedback essential for plasma based materials processing.

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.

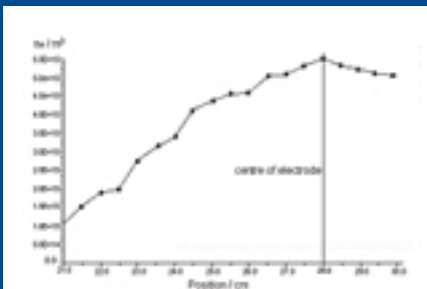
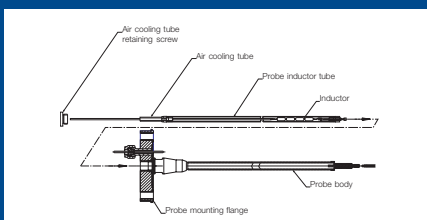


on-board timing circuitry

ESPION technology...at a glance



sub-microsecond resolution



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

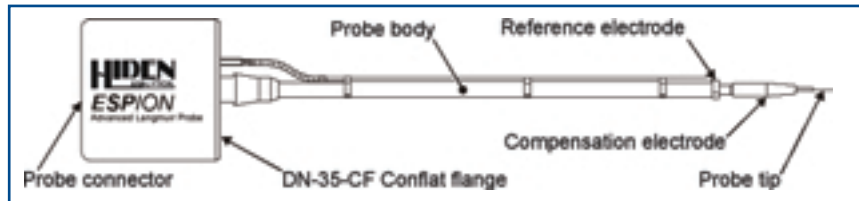
The plot opposite shows the electron density profile measured across the RF driven electrode of a 10W, 40mTorr Argon plasma. Measurements at each probe position are performed and analysed automatically and plotted in real time as the z-shift probe is stepped through the position sequence.



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

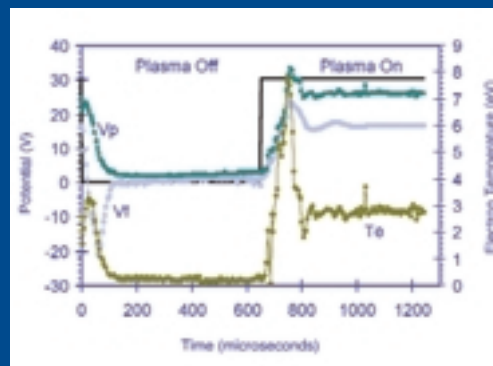
body alumina
 compensation electrode hard anodised aluminum
 tip material tungsten
 (others on request)
 reference electrode stainless steel
 air cooling inbuilt push fit connection

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

HIDEN

ANALYTICAL



Manufactured in England by:

HIDEN ANALYTICAL LTD

420 EUROPA BOULEVARD

WARRINGTON, WA5 7UN, ENGLAND

Tel: +44 (0)1925 445225 Fax: +44 (0)1925 416518

Email: info@hiden.co.uk

Web Site: www.HidenAnalytical.com

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

TECHNICAL DATA SHEET 152