

LANGMUIR PROBE

Plasma Volume Characterisation

Interchangeable Single & Double Probe system



Measures

- Floating potential (Single Only)
- Plasma potential (Single Only)
- Plasma density
- Ion current density
- Electron energy distribution function (Single Only)

Functionality

- Time averaged
- Time resolved
- Time trend

Features

- Langmuir probe automated electronics unit
- Advanced analytical software suite
- Replaceable probe head
- Quick start and advanced user modes
- Integrated air cooling
- External trigger
- DC compensation
- RF compensation

The Langmuir Probe is one of the most common and widely used plasma diagnostics and characterisation instruments to measure parameters in the bulk of the plasma. The Langmuir Probe measures plasma parameters such as floating potential, plasma potential, plasma density, ion current density, electron energy distribution function and electron temperature.

Impedans's Langmuir Probe has the most advanced technology on the market and analyses ion and electron currents to obtain accurate measurements of the plasma parameters in a wide range of plasma applications. Ours is the fastest and most reliable Langmuir probe on the market (time resolution 12.5 ns). In addition to speed and reliability, it provides the most advanced fully automated data analysis in real time.

The Impedans Langmuir Probe system comes complete with interchangeable single and double probe tips (at no extra cost) which can be used with the same electronics unit. This allows users to conduct experiments across different reactors and allows measurements in reactors which have a poor ground return.

The Langmuir Probe is used to establish plasma process repeatability. It helps the user to understand plasma changes and the impact on surface treatment. It is an essential plasma process diagnostic to understand the correlation between plasma inputs and the plasma state which reduces process and tool development time, as well as the time to market for new plasma products. Pulsed plasmas are used to tailor the electron or ion energy and the Langmuir Probe is an integral part of pulsed process development.

Measuring Parameters

Floating Potential	-145 V to 145 V
Plasma Potential	-100 V to 145 V
Plasma Density	10^6 to 3×10^{13} cm^{-3}
Ion Current Density	$1 \mu\text{A}/\text{cm}^2$ to $300 \text{ mA}/\text{cm}^2$
Electron Temperature	0.1 to 15eV
Electron Energy Distribution Function	0 to 100eV

Langmuir Probe Specifications

Plasma Power Source	DC, RF, Microwave, Continuous, Pulsed Plasma
RF Plasma	400 kHz to 100 MHz
Probe Length	300 mm to 1400 mm (Custom Available)
Probe Diameter	10 mm (Custom Available)
Probe Tip Length	10 mm (Custom Available)
Probe Tip Diameter	0.4 mm (Custom Available)
Probe Tip Material	W, Ta, Ni, Pt. (Custom Available)
Probe Customisation	90° , 45° Bend (Custom Available)
Maximum Operating Temperature	230°C (Custom up to 1200°C)

Electronics Control Unit

Probe Voltage Scan Range	-150 V to +150 V
Current Range	15 nA to 150 mA or $1.5 \mu\text{A}$ to 1 A for high current densities
Communication	USB 2.0
Sampling Rate	80 MSPS (V,I)
Data Acquisition Resolution	4.5 mV, 4.5 nA
Time Resolved Step Resolution	12.5 nS
External Trigger TTL Compatible	10 Hz to 1 MHz

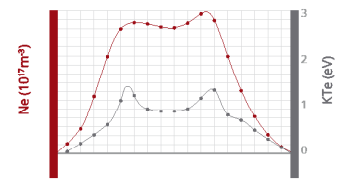
Operating Parameters

Pressure (Pascal)	0 to 1,000 Pa
Pressure (Torr) Single Probe	0 to 10 Torr
Pressure (Torr) Double Probe	0 to 760 Torr
Gas Temperature	20° to 1000°
Density	10^4 cm^{-3} to 10^{14} cm^{-3}
Gas Reactivity	Inert to Highly Reactive
Power Frequency	DC (0 kHz) • pDC (0 to 350 kHz) • MF (0 to 1 MHz) • RF (1 MHz to 100 MHz) • Microwave (1 GHz to 3 GHz)

Application Software

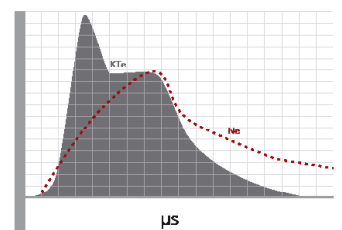
Operating System	Windows 2000 / XP / Vista / Windows 7 / Windows 8 / Windows 10
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Spatial Resolution



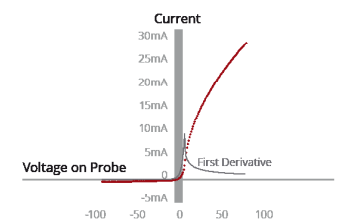
Spatial distribution of electron density and energy in a 150mm chamber

Time Resolution



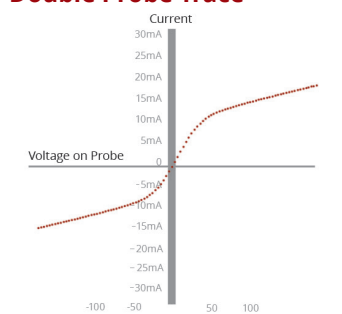
The electron energy and density in a micro-second pulse

Single Probe Trace



The current as a function of probe voltage in a plasma. The first derivative peaks at the plasma potential. All parameters are calculated automatically.

Double Probe Trace



The current as a function of probe voltage in a plasma. All parameters are calculated automatically.