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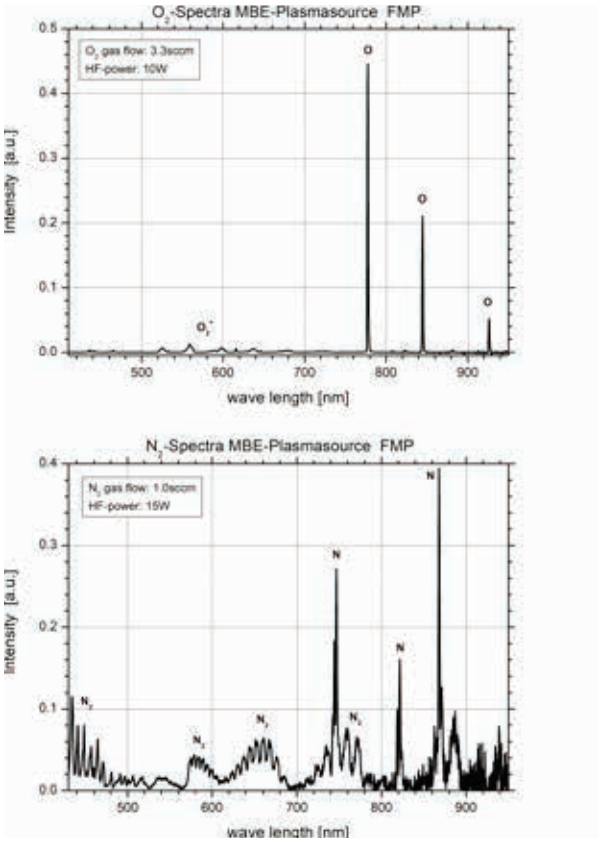
FREE MICROPLASMA SOURCE FMP

- High purity plasma creation
- Typical operation: 5 - 20 W / 2.5 GHz
- Typical gas flow: 1 to 10 sccm
- Suitable for different gas types (e.g., N_2, H_2 or O_2)
- Options: ion sensor, photo diode

FMP on DN40CF (O.D. 2.75") flange

Oxygen plasma (left picture) and Nitrogen plasma (right picture) at the tip of the source.



Typical optical spectra for O_2 and N_2

The Free Microplasma Source FMP produces a pure localized plasma at the tip. This setup provides high purity plasma creation with effectively reduced wall interaction as well as a drastically reduced RF power consumption due to the small plasma size.

Main advantages of the FMP:

- Free microplasma in front of injector, i.e.: reduced reactions with cavity materials
- Cold plasma (low ion energy)
- Multi-gas applications are possible
- Wide gas flux range without reconfiguration: 1-10 sccm
- Wide process chamber pressure range of 10^{-7} mbar to 10^{-2} mbar possible without reconfiguration (depending on pumping system)
- High efficiency plasma generation: no water cooling needed
- Very low HF power needed due to microplasma
- Simple and reliable operation
- Compact setup

Spectroscopy measurements with viewport:

The FMP comprises a viewport for optical access to the plasma. Using the viewport different measurements are possible, e.g. optical spectroscopy or operation and power control with a photo diode. Typical optical spectra for O_2 and N_2 are shown on the left.

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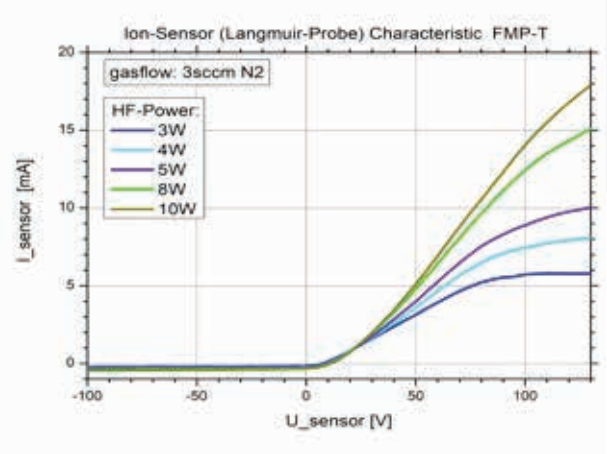
Applications

The Free Microplasma Source FMP provides a pure localized plasma for substrate cleaning applications, surface preparation or layer growth within an UHV chamber or MBE system at low chamber pressure.

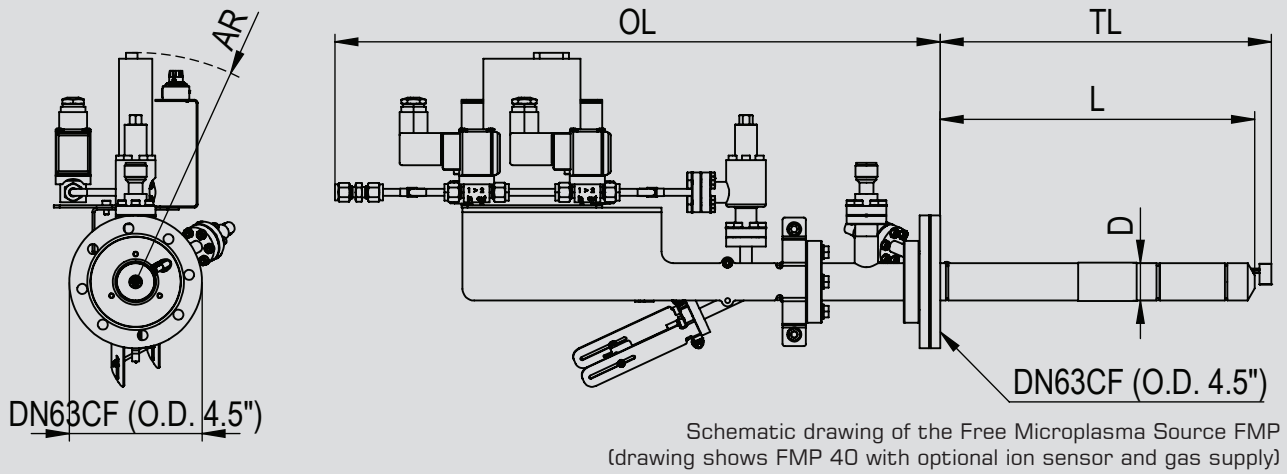
The ion sensor of the FMP can also be used as a plasma probe (Langmuir probe). The measured currents and potentials in this system allow the determination of the physical properties of the plasma. The FMP creates a non-equilibrium and non-uniform plasma in front of the source. All plasma parameters which are determined from ion sensor measurements have to be interpreted carefully. However, the ion sensor measurements may be used as a process parameter for reliable and reproducible source operation.
A typical ion current characteristic of the plasma measured with the ion sensor Langmuir probe is shown on the right. The measured electron current (positive bias voltage) and ion saturation current (negative bias voltage) show a strong dependency on HF power and gas flow rate.



Ion sensor (Langmuir Probe) characteristic for N_2

Technical Data

Mounting flange	DN40CF (with ion sensor DN63CF)
Dimensions in vacuum	L = 270 mm, D = 35 mm, TL = 282 mm (with ion sensor)
Dimensions airside	OL = 517 mm, AR = 196 mm (with ion sensor and gas supply)
Thermocouple	NiCr/NiAl (type K)
Bakeout temperature	max. 250°C
Operating temperature	up to 300°C
Power supply	<200 W
Additional equipment	all-metal valve, gas supply, RF generator
Variants	-M (inert gas, e.g. N_2, H_2) / -T (reactive gas, e.g. O_2)
Options	ion sensor (DN63CF), photo diode



Schematic drawing of the Free Microplasma Source FMP
(drawing shows FMP 40 with optional ion sensor and gas supply)

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