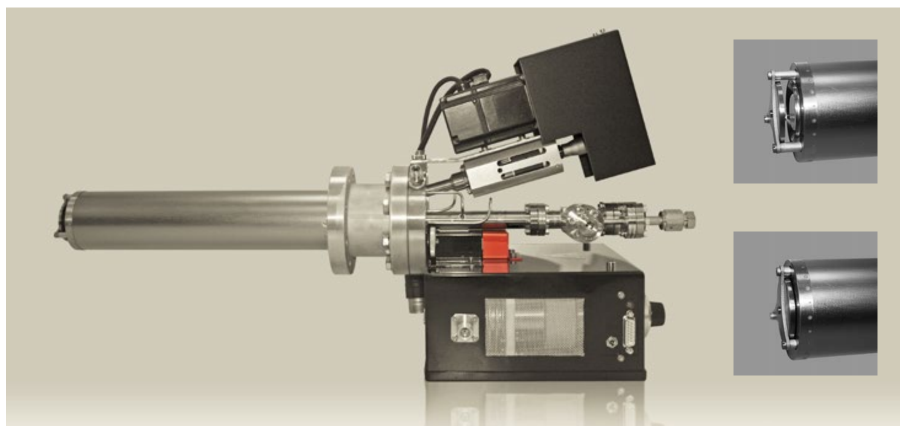
VRF-X 600 - Valved RF Plasma Source

Nitrogen / Oxygen

- **Patented design providing rapid changes from 0 to 10% in diluted nitride**
- **Reproducible production of reactive species**
- **Very high uniformity achieved**
- **Ideal design for dilute nitride applications**
- **Ready to use with no plasma stabilization time**
- **No changing of end pieces required**
- **Totally eliminates ions and minimizes layer defects**



Product introduction

Compared to standard RF Plasma sources, this new source offers an ease of control similar to the Valved Cracker cell compared to a standard effusion cell. While the valve is closed, the source can retain the same working conditions and is ready to use without needing to wait for the start-up and stabilization of plasma as required with the standard RF source. The unique, patented design of the Riber Valved RF Plasma source makes it a revolutionary atom or radical source providing rapid and reproducible reactive nitrogen species flow modulation and unsurpassed nitrogen concentration uniformity over large wafers. When high uniformity is required over large platens (for production systems), the Valved RF cell offers advantages concerning the working pressure in the chamber compared to other solutions using large diameter RF cells. The molecular nitrogen flow amounts to a few sccm with the Riber Valved RF source, versus several tens of sccm with a standard RF source featuring a large end plate diaphragm. This leads to a lower operating pressure in the system, allowing for better process conditions.. Dual gas injection panel is available in case gas mixing is requested.

Working principles

The RF plasma source operates by mean of an electrical field produced by the inductive coupling of the RF coil surrounding the cavity. A RF (13.56 MHz) generator delivers power to the discharge cavity space. To maximize power transfer to the plasma, a matching network is used to match the 50 Ohm impedance of the generator to the purely 50 Ohm impedance of the cavity load. Plasma in the cavity space produces atoms by dissociation of the molecular species. Atoms flow along with the non-dissociated molecules into the vacuum environment through an array of small holes at the front disk of the cavity («end–plate»).The hole arrangement is also called the «pattern». This pattern depends on application.

A large flux will require a large number of holes compared to an application where only a very small flux is required. Atoms generally have a very low recombination coefficient, so even those undergoing several wall collisions will ultimately contribute to the atom beam flux.

The main characteristic of the VRF-N lies in the use of a valve to control the nitrogen flow. The valve allows for the variation, adjustment and optimization of nitrogen flow without needing to change the diffuser model, in contrast to standard RF plasma sources.

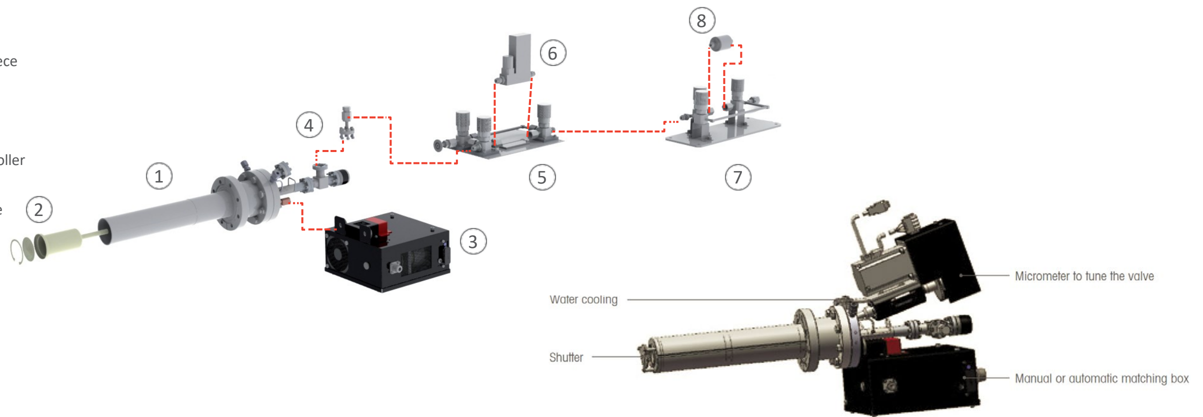
The electron sheet, covering the inside cavity walls, the hole sizes and shape are designed to minimize ions and electrons released from the cavity (Current lower than 10 nA / cm2).

Gas breakdown will occur above a certain pressure in the cavity. This pressure depends upon the gas ionization potential. As a result, and for a given cavity pattern, the flow rate of molecular gas will vary from gas to gas.

Plasma conditions is actively monitored via optical emission diagnostics to ensure flux stability and composition.

Layout

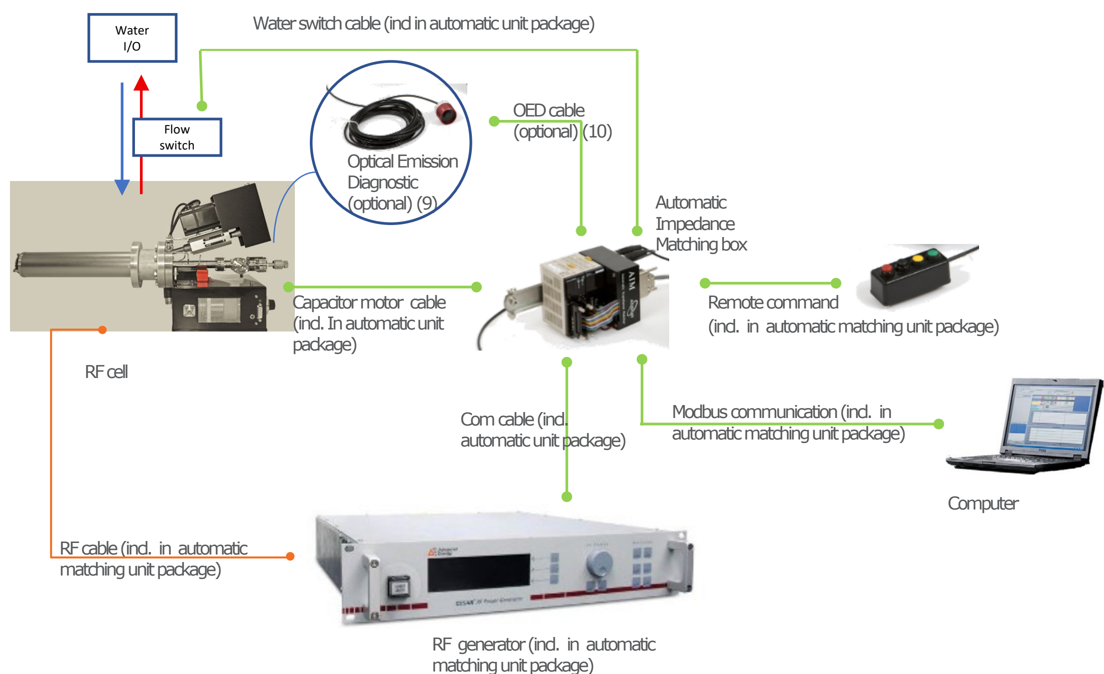
1 - Source body
2 – Cavity & end-piece
3 - Matching box
4 - Isolation valve
5 - Gas panel
6 - Mass flow controller
7 - Purifier panel
8 - Purifier cartridge



Specifications

	VRF-N 600	VRF-O 600
Cavity Material	PBN	Quartz
Cavity type	Single piece cavity	
Mounting flange	CF 63 min – adaptations available	
Tuning unit	Automatic matching box (2 modules) - *manual version also available*	
Power supply	600 W	
Plasma observation viewport	CF 16	
Flux valve	Integrated, micrometer motorized control	
Isolation valve	Included	
Gas inlet	DN CF 16 / VCR ¼’’	
RF coil water cooling	Included – Ø6mm Swagelok connection DP>2 bars 0,2 l/min	
RF tuning unit cooling	Air	
Water security switch	Included	
Options	Plasma optical emission detection	
	Gas panel + mass flow controller	
	Gas purifier panel	

Component interfacing



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CELLS & COMPONENTS – VALVED RF PLASMA CELL

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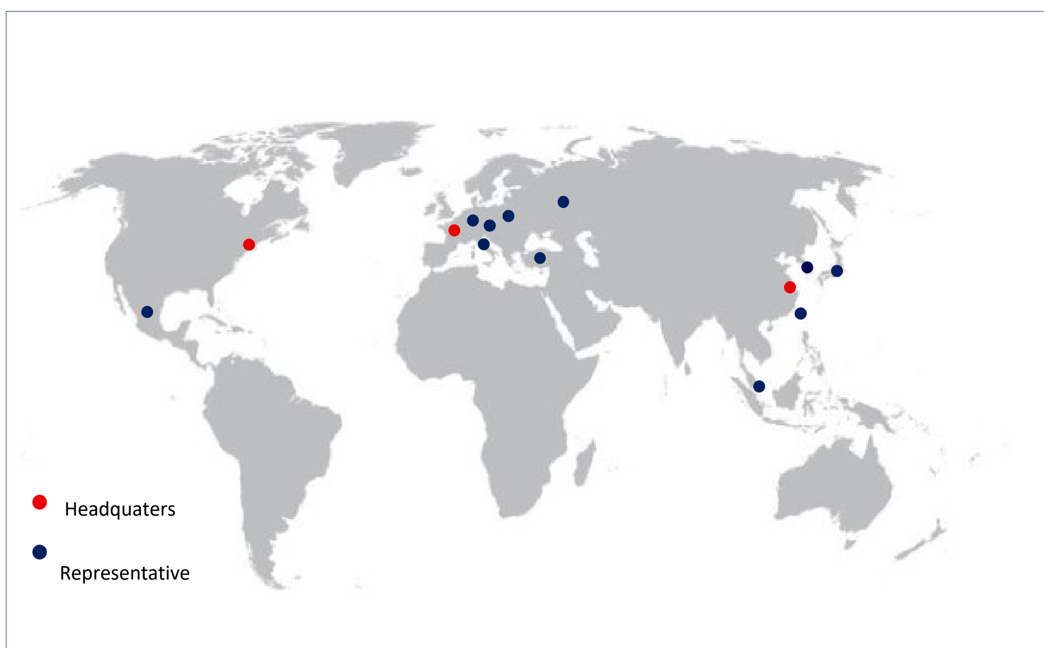
For more information, please contact your local sales representative



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