Spectrum® 3013
3.0 kW 13.56 MHz
3U Half Rack
RF Generator

Spectrum® RF Plasma Generator

13.56 MHZ MODEL 3013 AND 1513

Spectrum® generators feature high power density, excellent stability, generous power margins and high reliability for lower cost of ownership and improved yield, wafer-to-wafer and run-to-run. The Spectrum RF generator is available in power levels of 3.0 and 1.5kW at 13.56MHz.

The Spectrum RF Plasma Generator is used in Chemical Vapor Deposition (CVD), Physical Vapor Deposition (PVD), etching and other thin film applications during the manufacture of integrated circuits, flat panel displays, optical media and industrial coatings.

Features & Benefits

High Repeatability for Consistent Process Performance

- Forward Power Accuracy of ±1.0% of set point, tied to and transferable from NIST
- 500µsec response to power set point changes and process step transitions for improved uniformity

Smaller Footprint Reduces Required Tool Space

- Power density increased 2-3 times over previous models
- Integrated auto frequency tuning eliminates the need for a complex matching network

High Reliability Increases Uptime and Lowers CoO

- Improved thermal management and decreased power dissipation through the use of new, high efficiency power amplifier (PA)
- Push-pull resonant circuit topology lowers the voltages across the power transistors
- Ample power margin allows more forward power delivery and more strike voltage potential to bridge sub-optimal conditions with no process interruption

Power Delivery

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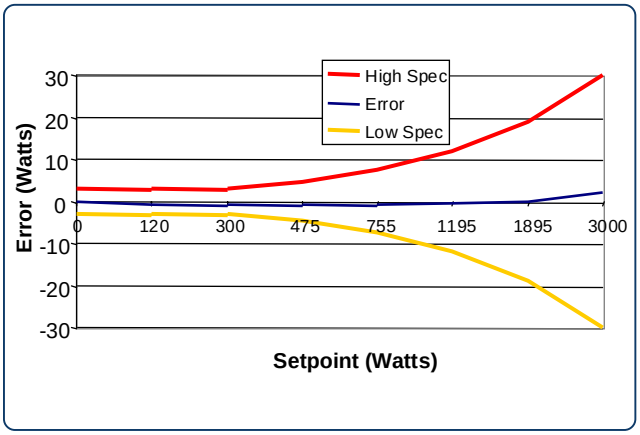
Spectrum® RF Generator Performance

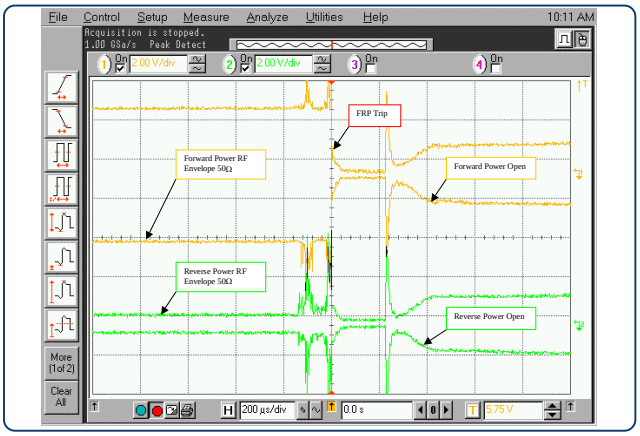
The Spectrum platform combines high performance specifications with a flexible, reliable design. The result is a robust platform for the most demanding thin film applications.

Accuracy

The Spectrum generator leads the industry with accuracy of ±1.0% of Forward Power tied to and transferable from the National Institute of Standards and Technology. High accuracy ensures tight process control and repeatability for advanced thin film processing.



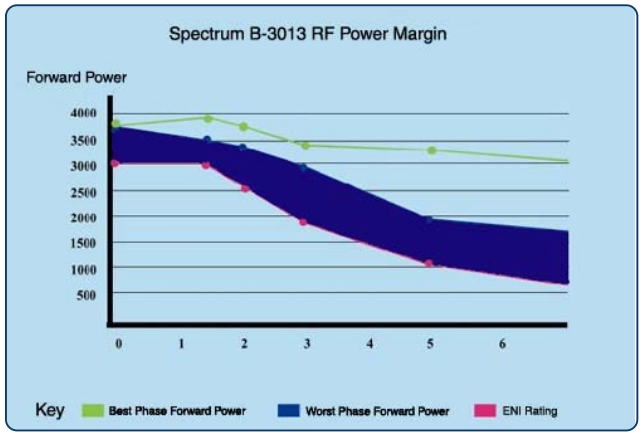
Spectrum Generator Forward Power Accuracy vs Output Power



Plot of drain source voltage and modulator detection and response at 200 microseconds per division

RF Power Margin

A key indicator of reliability is headroom or RF power margin. Having extra RF power capability ensures high performance, uptime and yield under difficult process conditions. RF power margin allows more forward power delivery into mismatched loads. On hard to ignite chambers, headroom provides more strike voltage potential. During conditions of lower line voltage, RF power margin allows full rated power to be delivered instead of de-rating the generator.



Spectrum RF Generator Power Margin

Automatic Frequency Tuning (AFT)

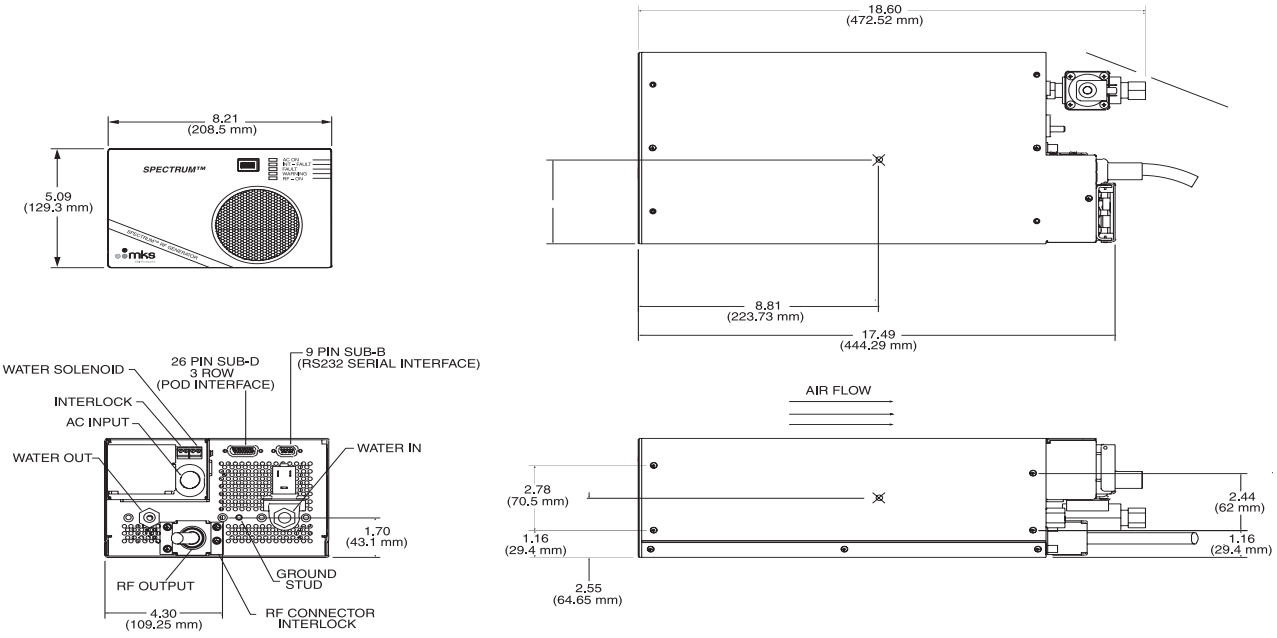
The Spectrum RF plasma generator incorporates automatic frequency tuning-impedance matching which eliminates the need for a complex matching network. AFT automatically locates the best operating frequency for optimal power transfer. The 13.56 MHz Spectrum generator is capable of tuning to ±5%.

Fast Transient Recovery

When an arc occurs within the plasma, the RF drive is quickly and momentarily shut off to the PA, thus preventing disruption of the process and damage to the generator, matching network, chamber or substrate. The generator will detect, react, and recover without any action needed from the user. Detection is typically within 5µS while react and recover timeframe is adjustable from 40µS to 4mS.

Safety and Performance

The Spectrum generator will shut down with a fault indication under the following conditions: Internal Temperature, Heatsink Temperature, Interlock Interrupt, or if any monitored circuit parameters reach a hazardous level. A warning indicator is provided to communicate a condition approaching the fault levels, as listed above, or conditions of line voltage out of range, high humidity, or condensation. This allows action to be taken before a fault would occur. Water flow is controlled to prevent condensation and is based on heatsink temperature and relative humidity.



Dimensional Drawing—

Note: Unless otherwise specified, dimensions are nominal value in inches (mm referenced)

Spectrum 3013 3U Half Rack

Specifications and Ordering Information

Parameter	Model #3013-00	Model #1513-00
Frequency		
Center (MHz)	13.56 ±0.005%	
Auto Frequency Tuning (bandwidth)	±5%	
Dynamic Power Range	30W - 3000W	30W - 1500W
Load Regulation (worst phase forward power)		
W nominal into 1.1:1 VSWR	3000W	1500W
W nominal into 1.5:1 VSWR	3000W	1500W
W nominal into 2.0:1 VSWR	2400W	1500W
W nominal into 3.0:1 VSWR	1700W	1500W
W nominal into ∞:1 VSWR	600W	600W
Load Transient Recovery	Forward power shuts down in approximately 5 microseconds if reverse power exceeds preset threshold (normally twice the steady-state reverse limit). Recovery period is adjustable from 200 microseconds (default) to 1.2 milliseconds	
Load Impedance Range	Unlimited	
RF Stability		
Spurious Output	Unconditionally stable for any load within operational limits < 50dBc into 50 ohm load	
Harmonic Output/Distortion	< 40dBc, Maximum (50 ohm load)	
Software Pulsing Parameters		
Frequency	0-1kHz	
Minimum Pulse Width	500µsec	
RF Rise/Fall Time	150µsec	
Power Control Accuracy[1]		
± 1% of Set Point	>300W	
± 1% of Full Scale	<300W	
Interface		
Standard	RS232, subminiature 9-pin Type DB9F; Versatile Monitor Interface	
Optional	External: 25 pin Analog, or DeviceNet™ or Profibus®	
Dimensions H x W x D inches (mm)	1.4 x 5.6 x 3.7 (36 x 142 x 94)	
Weight lbs (kg)	1.1 (0.5)	
Generator Dimensions[2]		
H x W x D inches (mm)	5.25 x 8.2 x 17.5 (133 x 208 x 444)	
U	3 U, Half Rack	
Generator Weight (maximum)	38 lbs (17 kg)	
Facility Requirements		
Primary AC Power Source	200/208 VAC ±10% 3 Phase	
Rated Current	20A	
Circuit Breaker	25A	
Ambient Temperature	+5 to +35°C, non condensing	
Cooling Water (minimum)	1.5 gpm (5.7 lpm)	
Compliance	CE to EMC 89/336/EEC and LVD 72/23/EEC; SEMI F-47; NRTL Listed	
RF Output Connector[3] **Type QC Flange**	HN	

[1] Subject to limits of Forward and Reverse Power, Current and Voltage
[2] Excludes handles and connectors
[3] Standard, others available, user configurable

Please contact your local MKS office for price and availability.

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