



*SurePower® 13.56 MHz
RF Generators from
3.5kW to 13kW and higher*

SurePower® RF Generator

13.56 MHz POWER SUPPLIES

The SurePower® platform of RF plasma generators is the most advanced class of 13.56 MHz generators commercially available. The SurePower® architecture incorporates state-of-the-art RF topologies, patented intrinsic power amplifier protection, improved design margins, and embedded V-I probe sensors to achieve the highest reliability, reproducibility, and accuracy of any generator in the marketplace today. The platform offers the highest power (13 kW) at 13.56MHz in a 3U height package. Optional auto frequency tuning allows the use of fixed matching networks for faster tuning, greater overall system reliability, and lower cost. CEX or common exciter can be added for synchronous operation of multiple SurePower generators. SurePower® is available in power levels from 3.5kW to 13.0kW and provides:

- Exceptional performance
- Higher power levels than competitive offerings
- Greatest delivered power to the plasma
- Excellent reliability

SurePower RF power generators are designed for all 13.56MHz applications including: PECVD, HDPCVD, PVD, ALD, etch and strip for the manufacture of integrated circuits, solar cells, flat panel displays, and data storage devices.

Features & Benefits

Exceptional Process Performance — Accuracy Over a Wide Dynamic Range

- Embedded sensor technology enables high accuracy power measurements across a wide dynamic range and into the most aggressive mismatched loads
- Forward power accuracy of $\pm 1\%$ of set point - traceable to NIST ensures repeatable process performance
- Frequency insensitive control to filter out intermodulation (IMD) products

Increased Value — Extra Power and Power Margin with Better Spectral Purity

- At 13kW, highest available power in its class
- 15% to 50% more power into a mismatched load than currently offered in the market
- Higher power for faster, more reliable performance in advanced nano-scale processes
- Increased spectral purity provides a cleaner signal for better process control



Features & Benefits (cont'd)

Auto-Frequency Tuning with up to $\pm 5\%$ Bandwidth — Higher Tuning Speed, Improved Reliability and Lower Cost

- Auto frequency tuning (AFT) impedance matching locates the best operating frequency for optimum power transfer, ensuring improved uniformity
- AFT provides the capability to de-tune from 13.56MHz to eliminate cross talk between generators for greater plasma stability
- AFT eliminates the need for mechanical match tuning providing improved system reliability and lower cost
- AFT improves tuning speed 30-50x over mechanical match for greater productivity

Excellent Reliability for Productivity and Uptime

- Patented protection circuitry limits reflected power into the transistors allowing the amplifier to ride through the most adverse load conditions such as plasma transients and arcs
- Advanced internal diagnostics provide better on-site troubleshooting for lower MTTR and higher availability

SurePower® RF Generator Performance

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

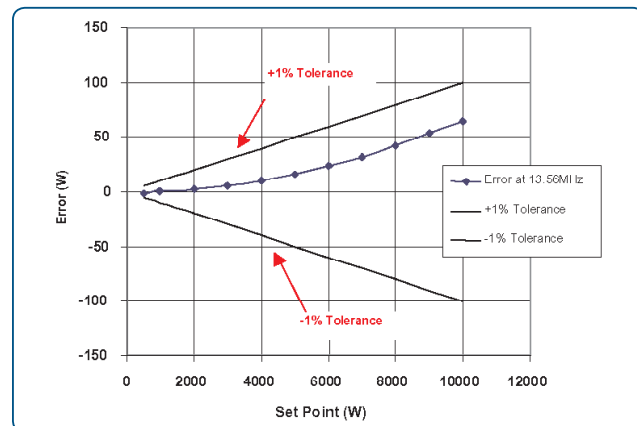


Figure 1 —
SurePower® Generator Forward Power Accuracy vs. Output Power

Clean Spectral Performance

The design of the SurePower® power amplifier incorporates advanced low pass filtering. The ability to suppress harmonics, ensures a clean spectral response. As shown in Figures 2 and 3, SurePower® has maximum harmonic output of -50db into a 50 ohm load for accuracy and process repeatability.

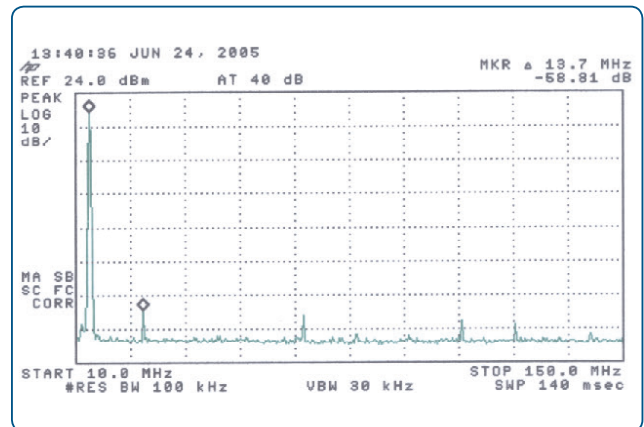


Figure 2 —
SurePower® 6.5kW RF Generator showing clean spectral response

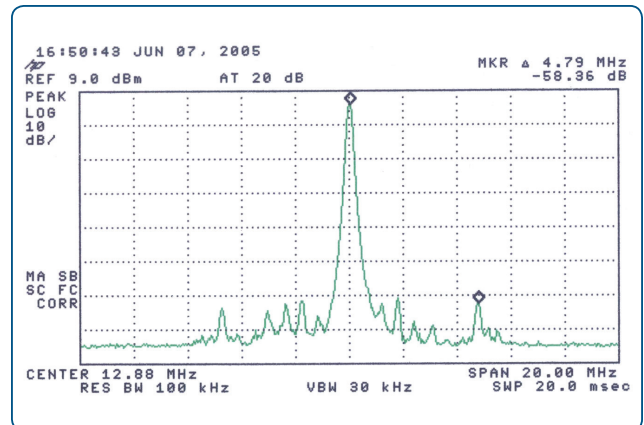


Figure 3 —
SurePower® Generator 2:1 VSWR showing low spurs

Delivered Power Accuracy

The embedded V-I sensor in the SurePower® design replaces the directional coupler used in conventional generators. The V-I sensor more accurately measures load conditions and provides feedback to control delivered power even in the presence of load mismatch. The result is improved power accuracy across the full dynamic range of operation. (See Figure 4.)

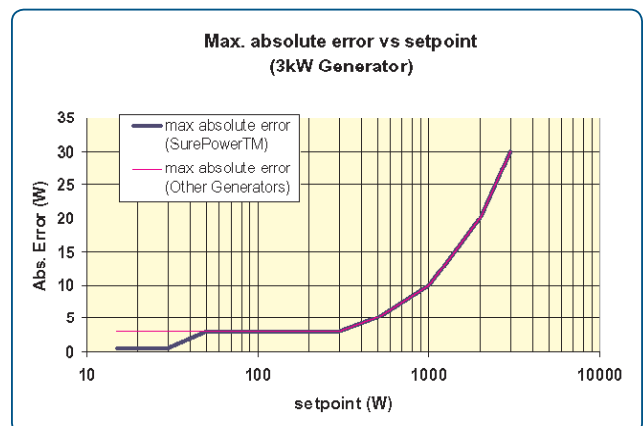


Figure 4 —
3.5kW SurePower® Generator with Optional Extended Low Power Accuracy



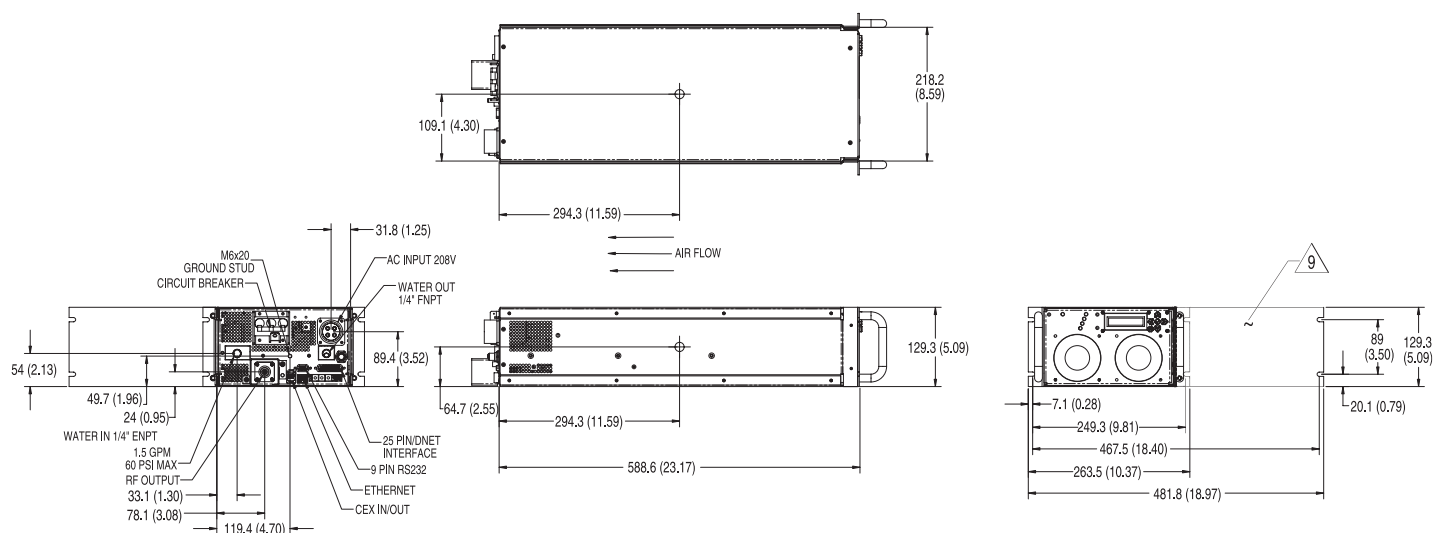
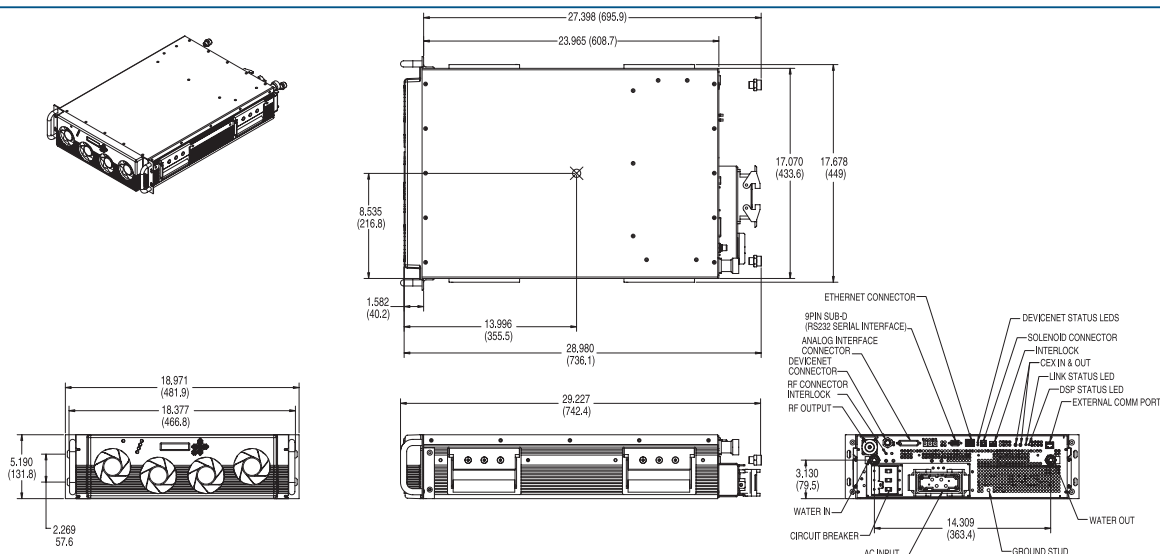
Specifications

Model	QL13013	QL10513	QL6513	QL5513	QL3513
Frequency	13.56 MHz	13.56 MHz	13.56 MHz	13.56 MHz	13.56 MHz
Frequency Stability and Accuracy	±0.005%	±0.005%	±0.005%	±0.005%	±0.005%
Auto Frequency Tuning (optional)	±5% bandwidth	±5% bandwidth	±5% bandwidth	±5% bandwidth	±5% bandwidth
Available Output Power					
Dynamic Power Range	130-13,000W	105-10,500W	65-6,500W	55-5,500W	35-3,500W
Load Dynamic Range (worst phase forward power)					
W nominal into 1.1:1 VSWR	13000W	10500W	6500W	5500W	3500W
W nominal into 1.5:1 VSWR	13000W	10500W	6500W	5500W	3500W
W nominal into 2.0:1 VSWR	10400W	8400W	5200W	4400W	2800W
W nominal into 3.0:1 VSWR	7800W	6300W	3900W	3300W	2100W
Configuration					
Form Factor	3U, full rack	3U, full rack	3U, full rack	3U, full rack	3U, half rack
Dimensions (exclusive of fittings, connectors, etc.)	17"W x 24"D x 5.25"H (max.)	17"W x 24"D x 5.25"H (max.)	17"W x 24"D x 5.25"H (max.)	17"W x 24"D x 5.25"H (max.)	8.5"W x 23"D x 5.25"H (max.)
Weight	120 lbs. Max	120 lbs. Max	120 lbs. Max	120 lbs. Max	60 lbs. Max
RF Output Connector	QC Flange (Type LC supplied)	QC Flange (Type LC supplied)	QC Flange (Type LC supplied)	QC Flange (Type LC supplied)	QC Flange (Type HN supplied)
Load Impedance Range	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Spurious and Harmonics at Full Rated Output					
PSU switching frequency and harmonics	-50 dBc, 50 ohm load	-50 dBc, 50 ohm load	-50 dBc, 50 ohm load	-50 dBc, 50 ohm load	-50 dBc, 50 ohm load
Harmonic Output	-50 dBc, maximum, 50 ohm load	-50 dBc, maximum, 50 ohm load	-50 dBc, maximum, 50 ohm load	-50 dBc, maximum, 50 ohm load	-50 dBc, maximum, 50 ohm load
RF Output Stability	-30dBc, across any load	-30dBc, across any load	-30dBc, across any load	-30dBc, across any load	-30dBc, across any load
Power Accuracy	The greater of ± 1% of set point or 0.1% of full rated power	The greater of ± 1% of set point or 0.1% of full rated power	The greater of ± 1% of set point or 0.1% of full rated power	The greater of ± 1% of set point or 0.1% of full rated power	The greater of ± 1% of set point or 0.1% of full rated power
Interface	Analog, RS232, subminiature 9-pin Type DB9F, Ethernet, DeviceNet™	Analog, RS232, subminiature 9-pin Type DB9F, Ethernet, DeviceNet™	Analog, RS232, subminiature 9-pin Type DB9F, Ethernet, DeviceNet™	Analog, RS232, subminiature 9-pin Type DB9F, Ethernet, DeviceNet™	Analog, RS232, subminiature 9-pin Type DB9F, Ethernet, DeviceNet™
Facility Requirements					
Primary A/C Power Source	200/208 VAC ±10%, 3PE-(3W+G), 50/60 Hz	200/208 VAC ±10%, 3PE-(3W+G), 50/60 Hz	200/208 VAC ±10%, 3PE-(3W+G), 50/60 Hz	200/208 VAC ±10%, 3PE-(3W+G), 50/60 Hz	200/208 VAC ±10%, 3PE-(3W+G), 50/60 Hz
Rated Current	64A/phase	48A/phase	36A/phase	32A/phase	19A/phase
Ambient Operating Temperature	+ 5 to + 40°C	+ 5 to + 40°C	+ 5 to + 40°C	+ 5 to + 40°C	+ 5 to + 40°C
Cooling Water Flow (minimum)	3.0 gpm	2.0 gpm	2.0 gpm	2.0 gpm	2.0 gpm
Safety Compliance	NRTL Listing UL61010-1(USA), CAN/CSA-C22.2 No. 61010-1, 93/68/EEC CE Marking Directive, 72/23/EEC Low Voltage Directive (LVD)	NRTL Listing UL61010-1(USA), CAN/CSA-C22.2 No. 61010-1, 93/68/EEC CE Marking Directive, 72/23/EEC Low Voltage Directive (LVD)	NRTL Listing UL61010-1(USA), CAN/CSA-C22.2 No. 61010-1, 93/68/EEC CE Marking Directive, 72/23/EEC Low Voltage Directive (LVD)	NRTL Listing UL61010-1(USA), CAN/CSA-C22.2 No. 61010-1, 93/68/EEC CE Marking Directive, 72/23/EEC Low Voltage Directive (LVD)	NRTL Listing UL61010-1(USA), CAN/CSA-C22.2 No. 61010-1, 93/68/EEC CE Marking Directive, 72/23/EEC Low Voltage Directive (LVD)
EMC Compliance	89/336/EEC EMC Directive, FCC 47 CFR 18 (FCC Part 18), EN 61000-6-4, EN 61000-6-2, Semi F47	89/336/EEC EMC Directive, FCC 47 CFR 18 (FCC Part 18), EN 61000-6-4, EN 61000-6-2, Semi F47	89/336/EEC EMC Directive, FCC 47 CFR 18 (FCC Part 18), EN 61000-6-4, EN 61000-6-2, Semi F47	89/336/EEC EMC Directive, FCC 47 CFR 18 (FCC Part 18), EN 61000-6-4, EN 61000-6-2, Semi F47	89/336/EEC EMC Directive, FCC 47 CFR 18 (FCC Part 18), EN 61000-6-4, EN 61000-6-2, Semi F47



Ordering Information

Contact your local account representative for pricing, availability, and applications guidance.



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