

XSTREAM REMOTE PLASMA SOURCE WITH ACTIVE MATCHING NETWORK

FULLY INTEGRATED PLASMA SOURCE PLATFORM FOR HIGH-FLOW
AND HIGH-PRESSURE, REACTIVE-GAS PROCESSES



The high-efficiency Xstream® platform, mounted outside the process chamber, generates neutral, reactive species from stable feed gases for the purposes of surface modification, chamber cleaning, thin-film etch, and plasma-assisted deposition.

The Xstream platform integrates a remote plasma source, a 8 kW or 10 kW high-efficiency power supply, and a patented, solid-state active matching network™ that accommodates the widest impedance operating range commercially available in a chamber clean source. The Xstream platform gives process engineers unsurpassed flexibility in their reactive-gas processes, thus improving system throughput and optimizing the use of expensive resources.

BENEFITS

- Optimizes the use of expensive resources
- Offers the widest impedance operating range commercially available
- Operates seamlessly with a broad range of chemistries, including existing PFC/O₂ in-situ chamber clean recipes
- Increases process performance, flexibility, and throughput
- Enables streamlined retrofits for both in-situ and remote CVD chamber cleans
- Leverages previously patented AE® active matching network™ technology

FEATURES

- Solid-state, on-board active matching network
- Fully integrated, high-efficiency, 400 kHz power supply
- Optional Virtual Front Panel (VFP) intuitive, real-time, software-based user interface
- Low water consumption
- Hard-anodized, low-particulate, corrosive-compatible metallic source chamber
- Advanced monitoring circuitry that measures actual power delivered to the plasma
- Readback signals for system integration and monitoring

XSTREAM® REMOTE PLASMA SOURCE WITH ACTIVE MATCHING NETWORK™

WIDEST IMPEDANCE OPERATING RANGE COMMERCIALY AVAILABLE

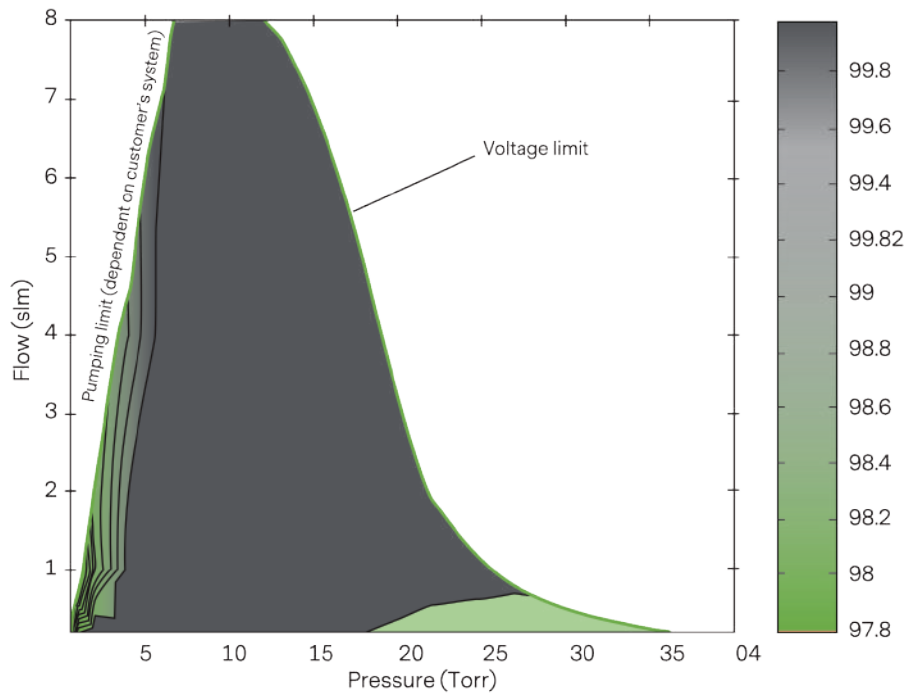
The integration of a remote plasma source, a power supply, and a solid-state active matching network enables the Xstream platform to operate in an expanded impedance range that's nearly one-and-one-half times that of other remote plasma sources.

OPERATES WITH A BROAD RANGE OF CHEMISTRIES

Incorporating previously patented AE technology, the solid-state active matching network allows seamless operation with a broad range of chemistries, including:

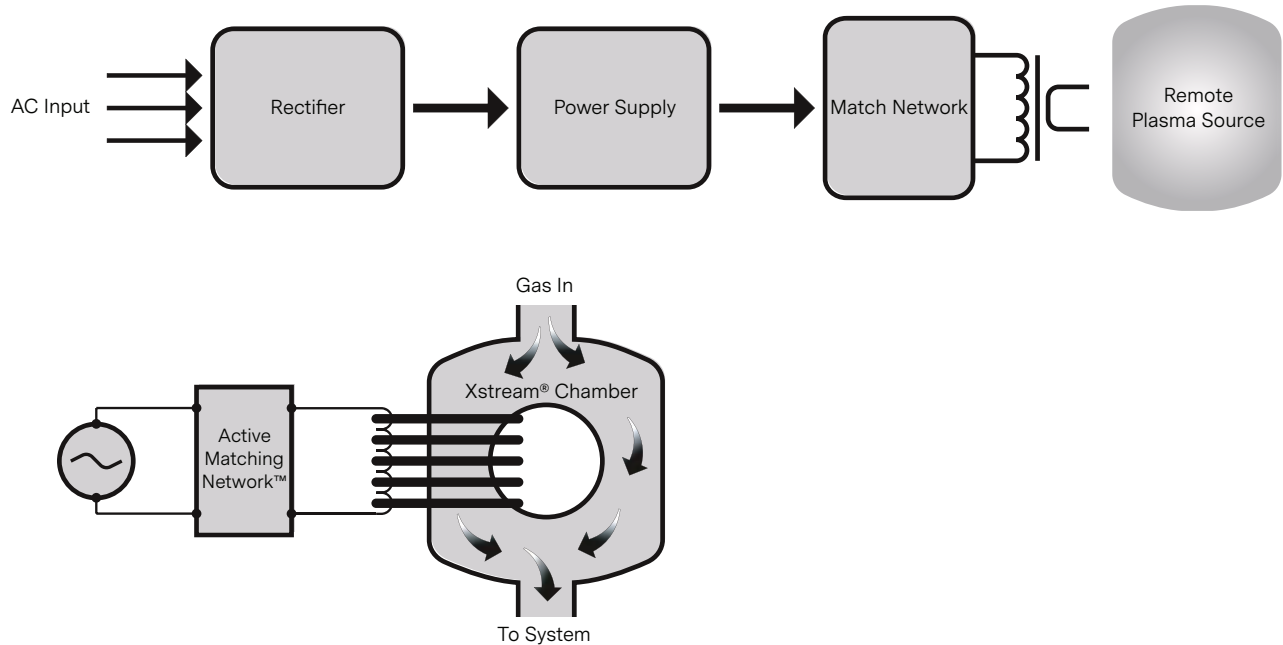
H	Ar	N ₂	O ₂	NF ₃
CF ₄	H ₂ O	N ₂ O	C ₃ F ₈	C ₂ F ₆
C ₄ F ₈	C ₄ F ₈ O	CHF ₃		

NF₃ DISSOCIATION PERFORMANCE



THEORY OF OPERATION

The Xstream remote plasma source uses mid-frequency RF power to generate a plasma that dissociates feed gases within a toroidally shaped, ferrite-coupled inductive plasma chamber. Because the plasma is isolated from the process chamber and wafer, only neutral, reactive species are emitted, thus reducing wear on the tool process kit, extending the time between expensive maintenance cycles and eliminating the possibility of charge damage to sensitive wafer structures. The Xstream platform uses a fully integrated, active matching network to optimize delivered power. The patented, solid-state active matching network, which incorporates patented AE technology, accommodates the widest impedance operating range commercially available.



INCREASES PROCESS FLEXIBILITY AND THROUGHPUT

A single Xstream unit can, for example, run reactive-gas deposition with N_2 or O_2 , then run a post-process chamber clean with a variety of fluorine chemistries—something previously impossible in a single, high-capacity chamber plasma source.

EASY TO RETROFIT FOR IN-SITU AND REMOTE CHAMBER CLEANS

The compact Xstream unit is especially well suited as a retrofit unit for chamber configurations with older microwave or toroidal RF plasma sources. The retrofit return on investment (ROI) is compelling: the Xstream platform can significantly reduce the downtime associated with RPS repairs and maintenance, as well as improve ignition reliability and process performance.

AE's flexible mounting options and tool retrofit kits streamline on-chamber installation.

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RELIABILITY AND COMPLIANCE

Designed for robust usage and long life, the Xstream platform has demonstrated an MTBF in excess of 450,000 hours in AE's reliability laboratory. It has received CE marking, NRTL/C verifications (pending), and SEMI F47 verification, and its EMC measurements are verified by TÜV Product Services.

VALUE-ADDED OPTIONS

Virtual Front Panel (VFP) gives you the ability to perform critical functions dynamically—and in real time:

- Process setup
- Troubleshooting
- Operational control

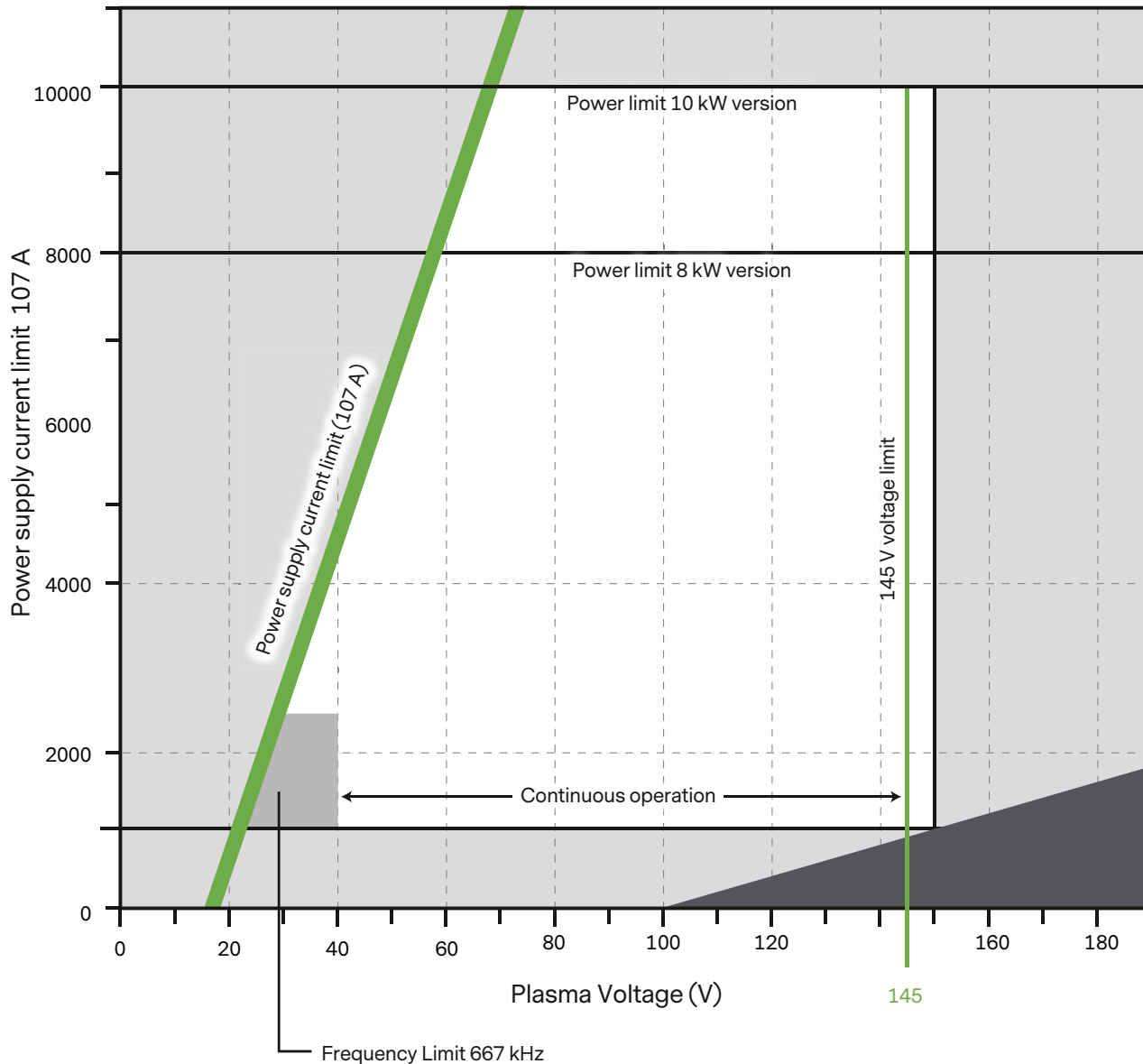
INSTALLATION AND TOOL UPGRADE KITS

To ensure seamless installation, AE offers Xstream options with the input gas on the top or the side of the source as well as custom process tool hardware kits. Contact an AE representative for details and availability.

PRODUCT TRAINING

Our commitment to you goes beyond delivering a world-class Xstream plasma-source platform. We offer advanced product training, so you can use the advanced capabilities of the Xstream to their fullest and thus optimize your current and future processes.

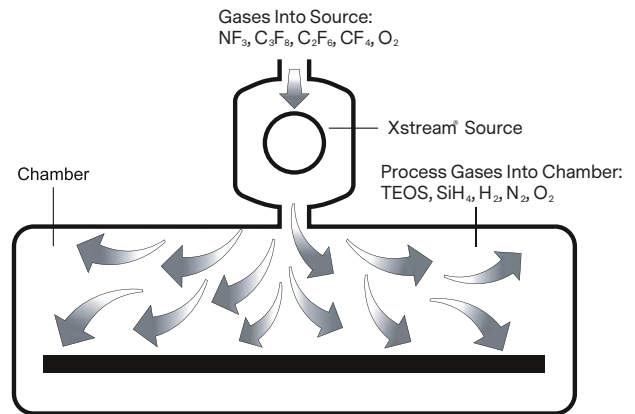
IMPEDANCE RANGE



TYPICAL APPLICATIONS

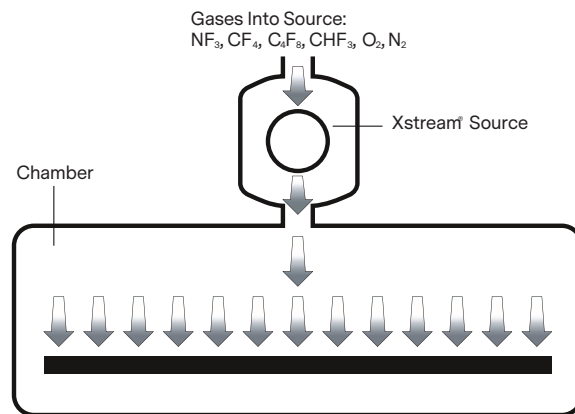
CVD Chamber Clean

- HDP-CVD process chamber clean by reactive-gas species (F atom)
- PECVD process chamber clean by reactive-gas species (F atom)
- Low-k CVD chamber clean by reactive-gas species (O atom, F atom)
- WCVD chamber clean by reactive-gas species (F atom)
- Vacuum exhaust foreline clean by reactive-gas species (O atom, F atom)



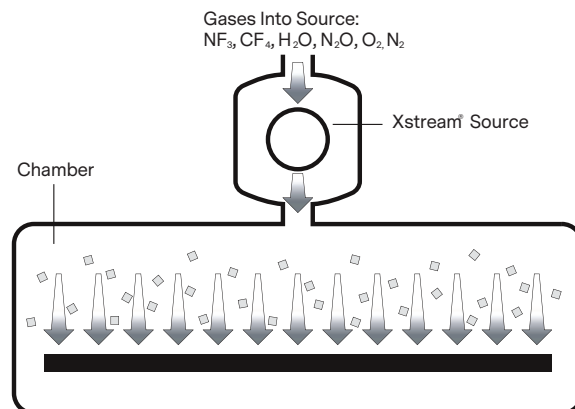
Surface Treatment, Reactive Etch, and Plasma-Assisted Deposition

- Surface modification by reactive substitution (surface oxidation)
- Assisted PECVD
- Assisted, low-pressure, reactive-sputter deposition with pre-activated oxygen and nitrogen
- Reactive-evaporative deposition with pre-activated oxygen and nitrogen
- Plasma-enhanced atomic layer deposition (PEALD)



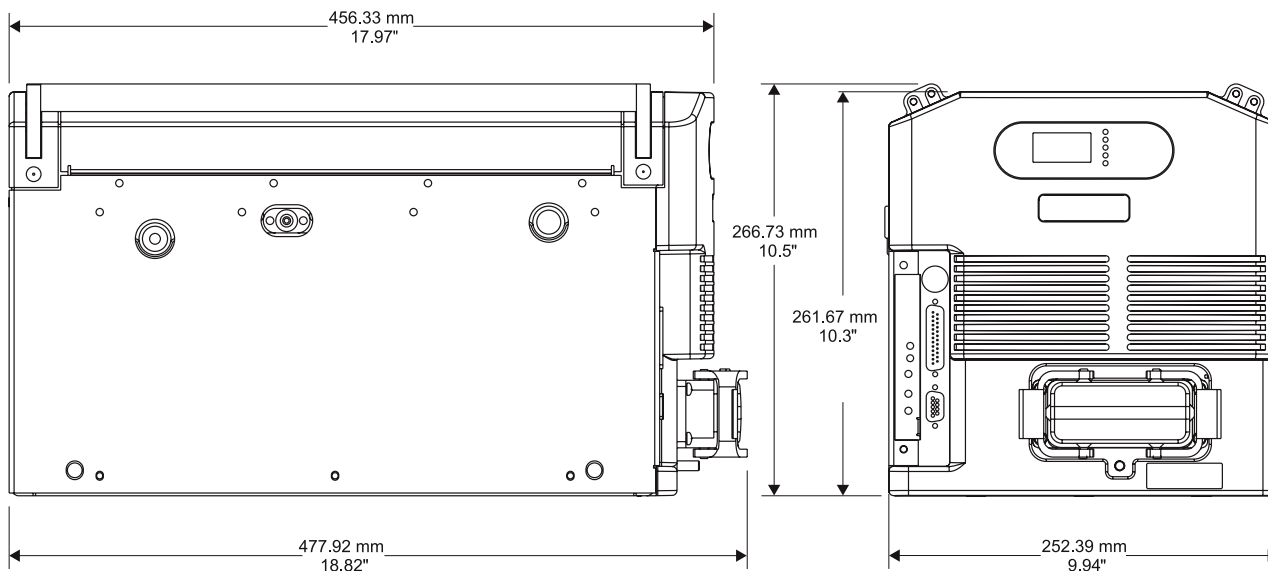
Etch

- Ashing (removal of carbon-based compounds from surfaces)
- Photoresist strip by reactive, oxygen-bearing gas species



SPECIFICATIONS

	8 kW unit	10 kW unit
General Operating Parameters		
Plasma Power Range	1000 to 8000 W	1000 to 10000 W
Process Applications	Remote delivery of gases for CVD chamber cleaning, reactive-etching processes, and reactive-deposition processes	
Ignition	100 mTorr to 4.00 Torr, Ar < 1 slm	
Chemical Compatibility	Intended for use with selected gases, such as Ar, O ₂ , H ₂ , N ₂ , F ₂ , H ₂ O, NF ₃ , or O ₂ : CxF _y . Note: Other gases and chemistries may be selected; contact AE Technical Support for suitable combinations.	
NF₃ Operating Specifications		
Flow Range	Up to 6 slm at 12 Torr	Up to 8 slm at 6 Torr
Pressure Range	Up to 15 Torr at 1 slm	Up to 15 Torr at 1 slm
NF ₃ Dissociation Efficiency	> 98% dissociation at 6 slm and 7 Torr at 8 kW as measured by FTIR	> 98% dissociation at 8 slm and 6 Torr at 10 kW as measured by FTIR
Operating Specifications		
Duty Cycle	Continuous operation within specified operating range	
Cooling Flow Rate	2 gpm @ 8 kW and 25°C (77°F) input water	
Ambient Air	+5 to +40°C (+41 to +104°F)	
AC Electrical Requirements		
Input Voltage	200/208 VAC ±10% (180 to 229 VAC), no neutral, 3 Φ with ground (Φ insensitive)	
Line Frequency	50/60 Hz nominal; 47 to 63 Hz range	
Input Current	27 A nominal, 31 A max per Φ	30 A nominal, 35 A max per Φ
Weight	28.7 kg (63.2 lb)	
Demonstrated Reliability	> 450,000 h MTBF	





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ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

PRECISION | POWER | PERFORMANCE

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