ADVANCED ENERGY®

XSTREAM® REMOTE PLASMA SOURCE WITH ACTIVE MATCHING NETWORK™

Fully integrated plasma source platform for high-flow and high-pressure, reactive-gas processes

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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.

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/O_2 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

The Xstream platform integrates a remote plasma source, a 6 kW or 8 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.

Widest Impedance Operating Range Commercially Available

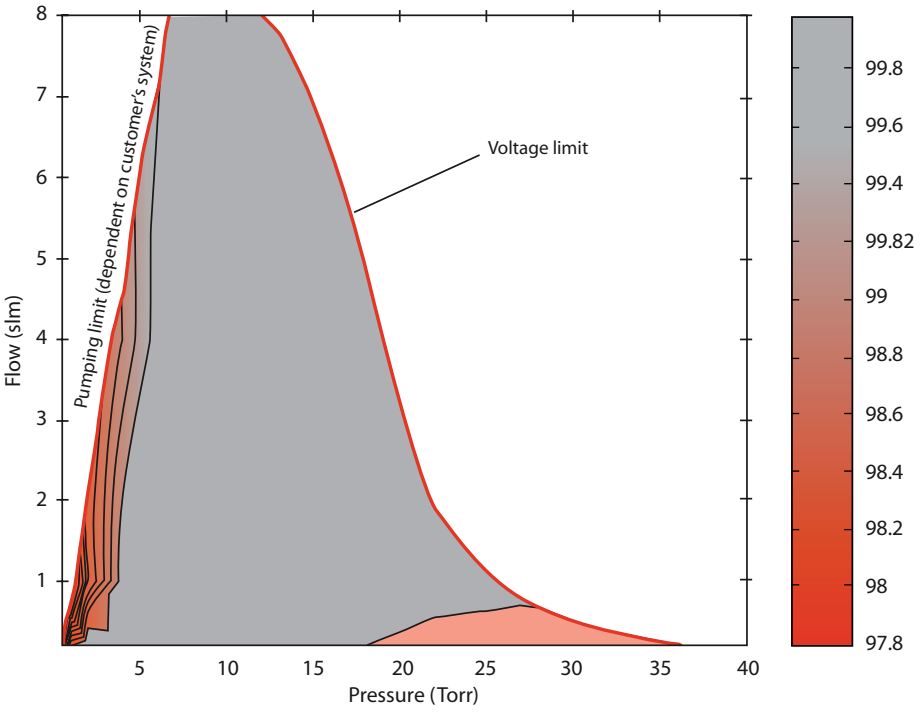
The integration of a remote plasma source, a power supply, and a solid-state active matching network enables the Xstream platform to operate in an expanded impedance range that's nearly one-and-one-half times that of other remote plasma sources.

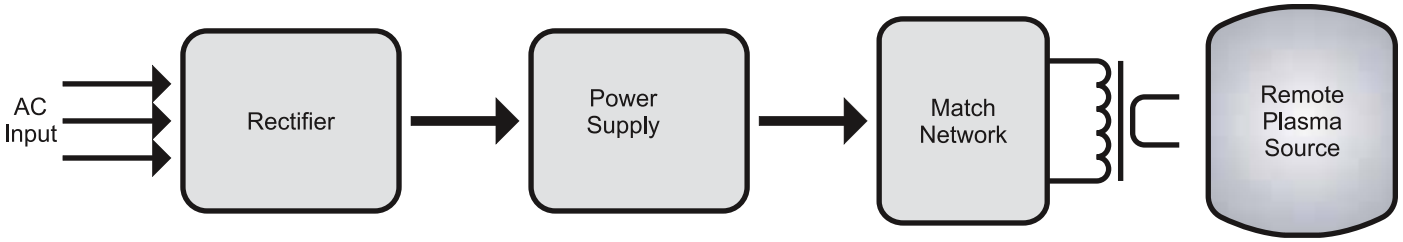
Operates With a Broad Range of Chemistries

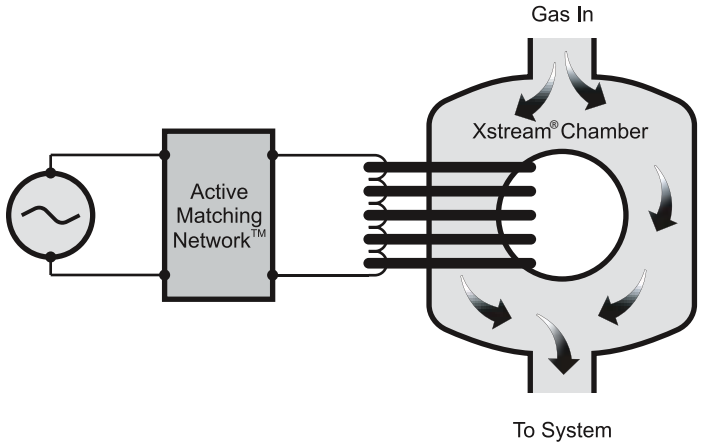
Incorporating previously patented AE technology, the solid-state active matching network allows seamless operation with a broad range of chemistries, including:

H	Ar	N_2	O_2	NF_3
CF_4	H_2O	N_2O	C_3F_8	C_2F_6
C_4F_8	C_4F_8O	CHF_3		

NF_3 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 amount of expensive clean gas your existing process consumes (see the example) or dramatically reduce PFC emmissions from the exhaust.

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

Low Water Consumption

The Xstream platform is both air and water cooled. Compared to other commercially available plasma sources, the Xstream uses remarkably little water (the 6 kW version uses only 1.0 gpm)—further reducing your operating costs and minimizing fab resource usage.

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)

This intuitive computer interface gives you the ability to perform critical functions dynamically—and in real time:

- Process setup
- Troubleshooting
- Operational control

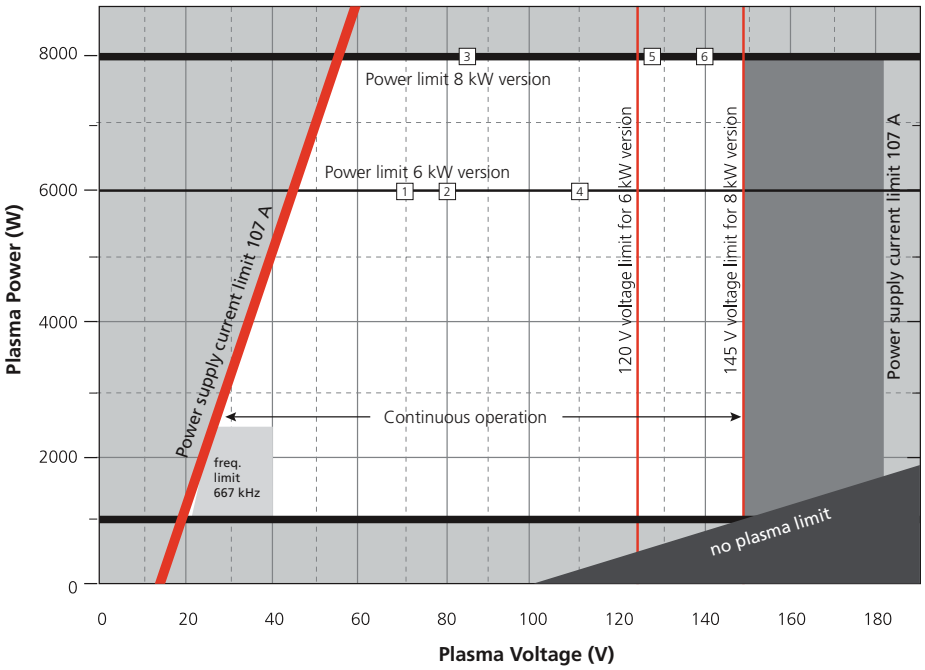
Installation and Tool Upgrade Kits

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



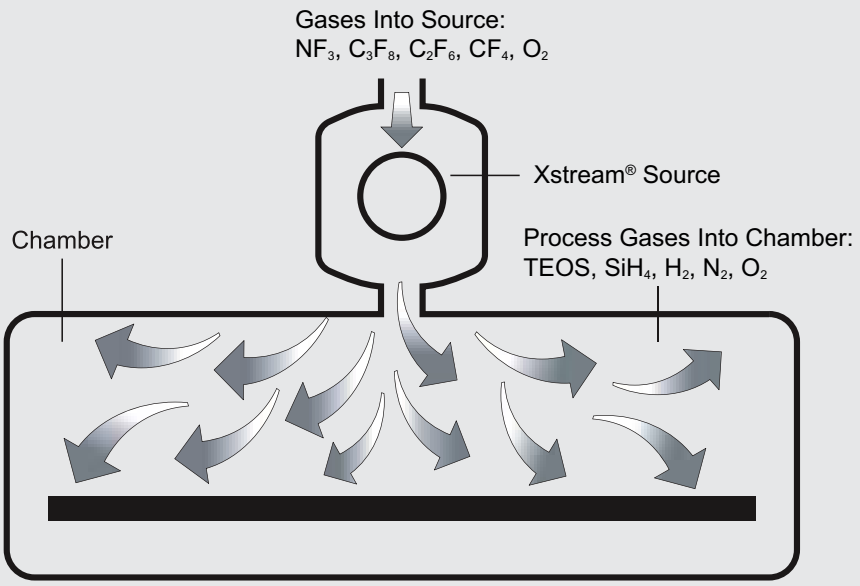
See Above Graph	Pressure (Torr)	NF_3 (sccm)	Vp (V)	Power (kW)
1	**1.5**	1000	72	6.0
2	**3.5**	3000	81	6.0
3	**4.0**	2000	86	8.0
4	**6.0**	3000	111	6.0
5	**10.0**	6000	125	8.0

See Above Graph	Pressure (Torr)	C_3F_8/O_2 (sccm)	Vp (V)	Power (kW)
6	**1.2**	600/2200	139	8.0

Typical Applications

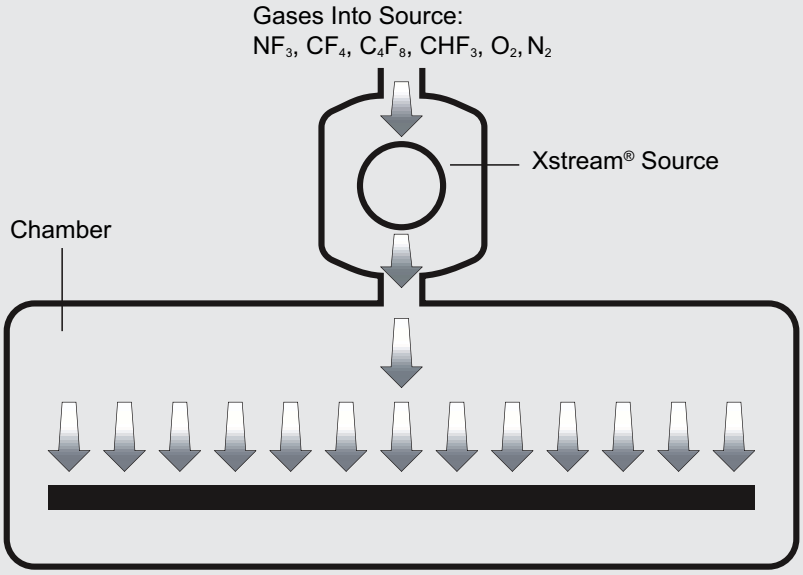
CVD Chamber Clean

- 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)



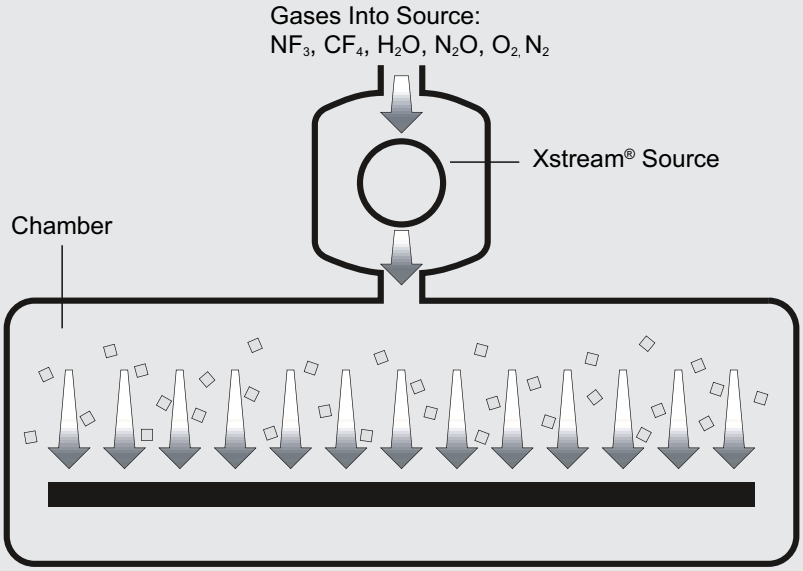
Surface Treatment, Reactive Etch, and Plasma-Assisted Deposition

- 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)



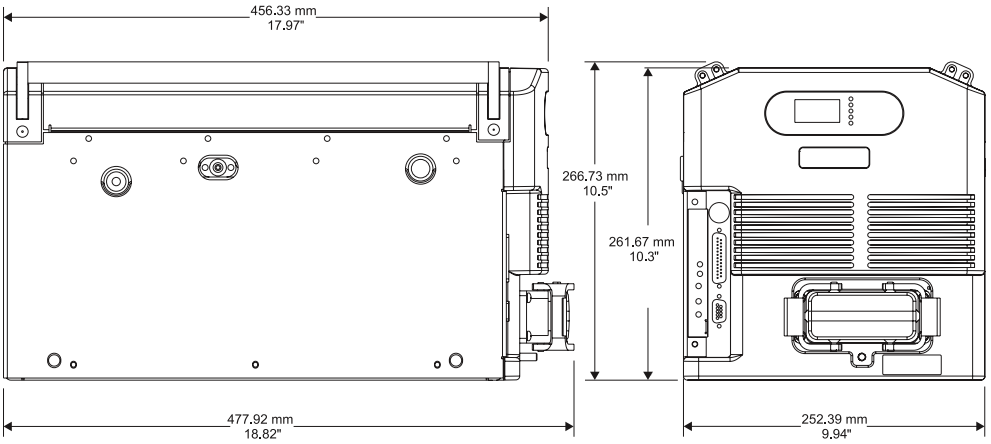
Etch

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



Summary Specifications

	8 kW unit	6 kW unit
General Operating Parameters		
Plasma Power Range	1000 to 8000 W	1000 to 6000 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_2O, NF_3, or O_2: CxFy.	
	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 4 slm at 6 Torr
Pressure Range	Up to 15 Torr at 1 slm	Up to 10 Torr at 1 slm
NF3 Dissociation Efficiency	> 98% dissociation at 6 slm and 7 Torr at 8 kW as measured by FTIR	> 98% dissociation at 4 slm and 5 Torr at 6 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; 1.0 gpm @ 6 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	20 A nominal, 24 A max per Φ
Weight	28.7 kg (63.2 lb)	
Demonstrated Reliability	> 450,000 h MTBF	



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Specifications are subject to change without notice.

AE Xstream Remote Plasma Source products are not for sale or use in the U.S. or Europe.

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