



MODEL AX6300

FLEXIBLE CVD DIAMOND REACTORS AND SYSTEM

- ◆ High quality CVD diamond films for a wide variety of applications
- ◆ Flexible reactor design supports high pressure microwave and magnetized microwave CVD
- ◆ Development time minimized with supplied CVD diamond process recipes
- ◆ Reliable, stable, reproducible, versatile operation
- ◆ Modular approach to suit a wide range of budgets
- ◆ Extensive after-sales support

Seki Technotron

Seki CVD DIAMOND PRODUCTS

ASTeX CVD diamond products allow straightforward entry into the active worldwide R&D and commercial market for this exciting new material. Many properties of diamond make it the material of choice in a variety of applications. Diamond is an insulator with the highest room temperature thermal conductivity, making diamond an ideal material in thermal management applications. Diamond is also the hardest material known and can be used in tooling applications for the machining of high silicon content aluminum, wood, and advanced composites. Diamond has excellent optical transmission properties from the ultraviolet to the infrared, microwaves, and beyond. Diamond can also be doped to form a semiconductor with a wide band gap (5.5 eV), which is of interest for electronics operating at high temperatures. Thick film applications to thermal management are among the fastest growing in the industry.

AX6300 Flexible CVD Diamond System: A complete, turnkey system for the deposition of diamond, diamond-like carbon, and other nitride and carbide thin films. Two optional electromagnets may be used as a divergent field electron cyclotron resonance (ECR) source for operation at low pressures and low temperatures. A range of heated and cooled substrate holders and a choice of ASTeX microwave generators are available.

THE Seki ADVANTAGE

- ◆ **High quality CVD diamond films for a wide range of applications**

The AX6300 incorporates the latest ASTeX process developments for high quality films for application in electronics, optics, thermal management, and tools. The AX6300 deposits CVD diamond on 2-in. diameter substrates with good thickness uniformity. Substrates up to 4-in. diameter can be accommodated.

- ◆ **Flexible reactor design supports high pressure microwave and magnetized microwave CVD**

ASTeX's unique, flexible reactor and patented microwave coupling design allow microwave CVD processing at high pressure (> 10 Torr), at medium pressure (~ 100 mTorr with optional magnets), and at low pressure (< 10 mTorr with optional magnets and optional streaming chamber). Magnetized CVD can be used to grow DLC, carbides, and nitrides.

- ◆ **Process recipes minimize development time**

Detailed CVD diamond process recipes are provided which enable the AX6300 to deliver complete solutions. ASTeX's world-leading laboratory and technical staff provide ongoing process support as CVD diamond technology advances.

- ◆ **Reliable, stable, reproducible, versatile operation**

The AX6300's field-proven design and industry-standard components provide excellent reliability.

ASTeX's unique expertise in microwave plasmas has led to a cavity design that is stable, easy to tune, and flexible in its operating regime.

Reproducible, high quality films are ensured by use of ASTeX's high stability, switching mode microwave power generators and other advanced instrumentation.

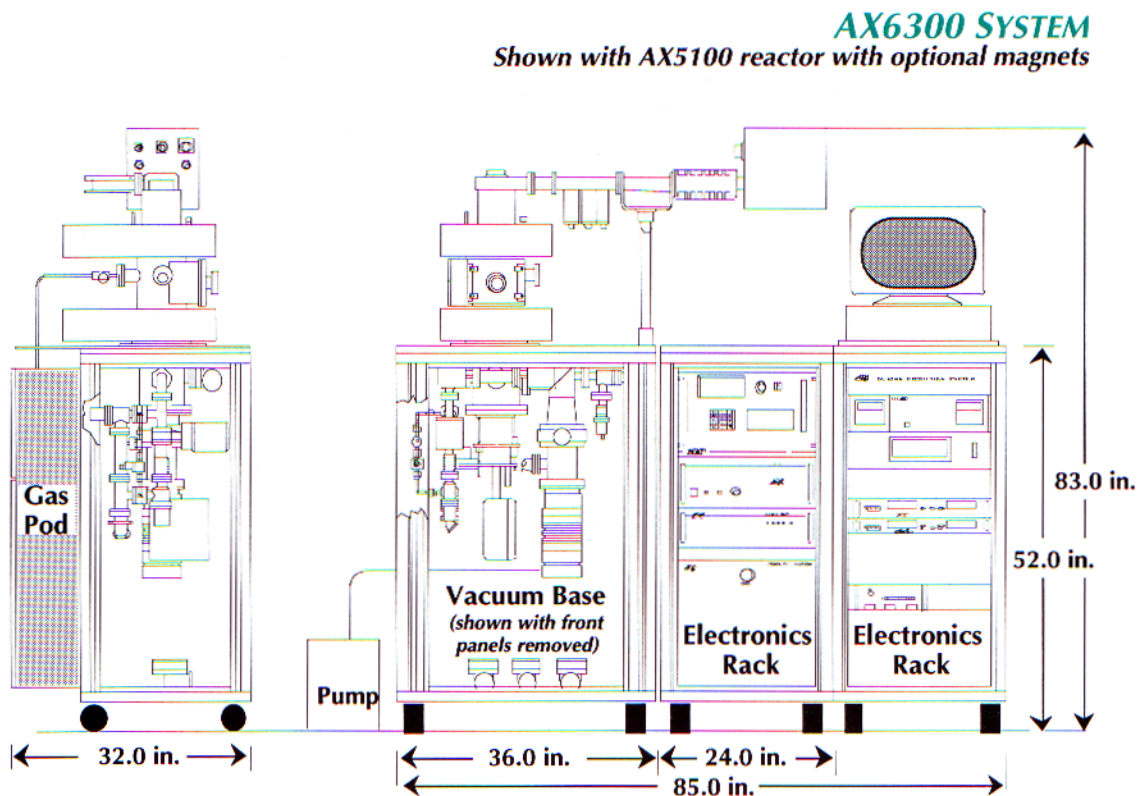
ASTeX reactors are designed for process reliability, allowing the user to explore fully the diamond deposition region in the C/H/O diagram. A wide variety of liquids or gases can be fed into ASTeX reactors to optimize the film characteristics for the customer's particular application.

◆ Computer-controlled turnkey operation

The AX6300 system incorporates full computer control for one button operation. The industry-standard PC includes facilities for data acquisition and data logging. User-friendly process software, together with careful monitoring of all system functions, provides a system that can confidently and safely be used in the most demanding R&D or pilot production environments.

◆ Available installation, on-site training, and after-sales support

ASTeX's worldwide network of highly trained personnel can provide installation of reactors or systems together with on-site training in the relevant aspects of CVD diamond growth. Full after-sales service and a variety of service contracts are also available.



AX6300 SYSTEM SPECIFICATIONS

Processing Chamber:

Stainless steel, metal-sealed high vacuum construction

Substrate Stage:

Height adjustable for 4 in. diameter substrates

Microwave Power Generator:

500 – 1500 W at 2.45 GHz, high regulation (0.5%) and low ripple ($\pm 1\%$)

System Base:

Includes frame with removable panels and utility bulkheads

Vacuum System:

Complete pumping system including automatic pressure control

Control System:

IBM-compatible PC and associated instrumentation

Control Software:

Simple user-defined package, flexible for multistep processing

Gas Handling:

Four mass flow controlled lines in sealed and extracted gas pod

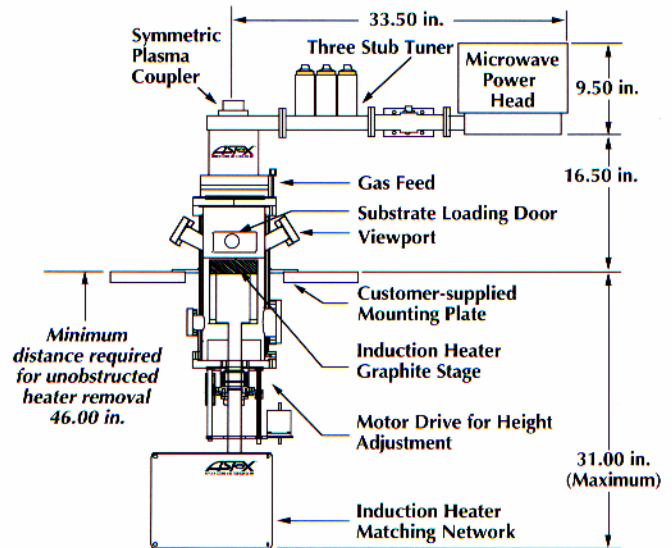
Control Rack:

Houses instrumentation and provides power distribution and EMO circuit

Electromagnets:

Water-cooled, 1300 Gauss maximum field at source

AX5000 REACTOR
Available as a stand-alone source
for R&D environments



AX6300 SYSTEM OPTIONS

For expanded system sophistication:

- OPT017 **Standard Turbomolecular Pump Package**
- OPT015 **Medium Pressure Option**
(magnetized 100 to 500 mTorr)
- OPT018 **Low/Medium Pressure Option**
(ECR < 20 mTorr)
- OPT019 **Additional Gas Channel**
- OPT020 **Midplane Gas Ring**
- AX6220 **Remote Process Monitor**
- AX6223 **Temperature Measurement System**
(two color)
- AX6310 **Window Magnet and 5.0 kW Power Supply**
- AX6311 **Exit Magnet and 2.5 kW Power Supply**
- AX6312 **Streaming Chamber (for ECR)**

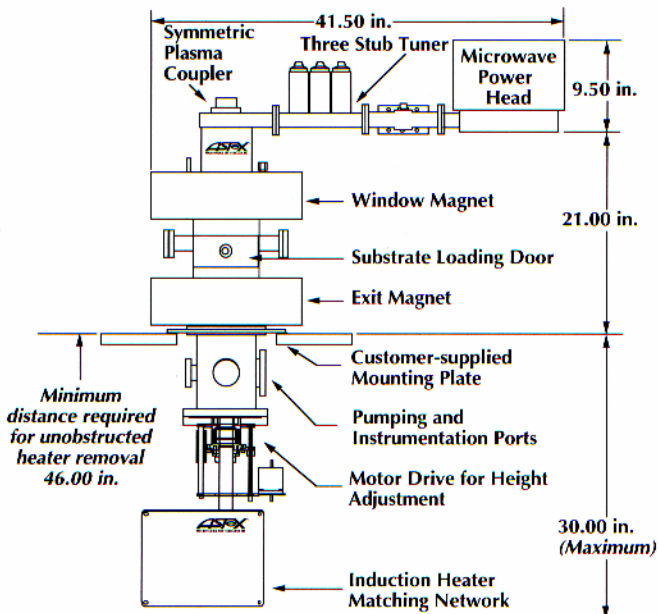
AX5000/AX5100 REACTOR OPTIONS

Simple, add-on, purpose-specific component kits which enable AX5000/AX5100 reactor users to produce high quality diamond right after delivery:

- KIT1-GHK **Gas Handling and Pressure Control Kit.**
- KIT2-PBK **Plumbing Kit**
- KIT3-LPK **Low Pressure (< 10 Torr) Kit**
- KIT4-PPK **Pumping Kit**
- KIT4a-PPKC **Corrosion-Resistant Pumping Kit**

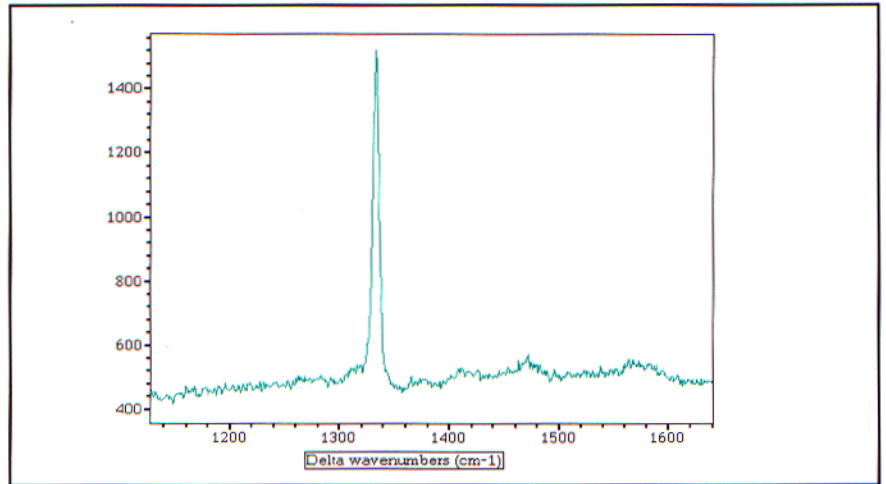
For expanded reactor sophistication:

- AX4110 **Exit Magnet and 2.5 kW Power Supply**
(AX5100 only)
- AX4111 **Window Magnet and 5.0 kW Power Supply**
(AX5100 only)
- AX5110 **5 kW Microwave Power Supply and Components**
(AX5100 only)
- AX5111 **Water-Cooled Substrate Stage Assembly**
(AX5100 only)

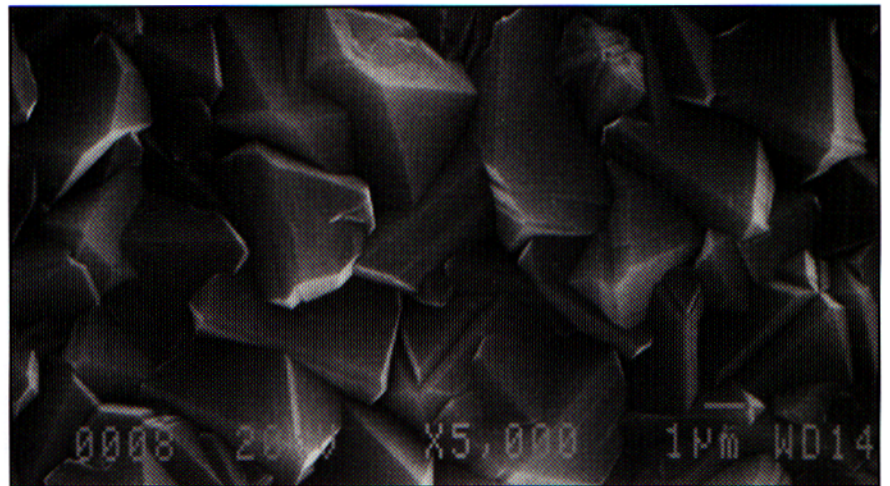


AX5100 REACTOR
Available as a stand-alone source
for R&D environments

HIGH QUALITY CVD DIAMOND



Raman spectrum of a CVD diamond film [spectrum taken with a Renishaw Ramascope® (632.8 nm laser), distributed in the U.S. by ASTeX].



SEM of a diamond film.



Diamond membrane approximately 2 µm thick. (Membrane courtesy of Dr. Henry Windischmann, BP America, Inc.)