



kSA MOS Thermal-Scan

Model 200-HT-2D

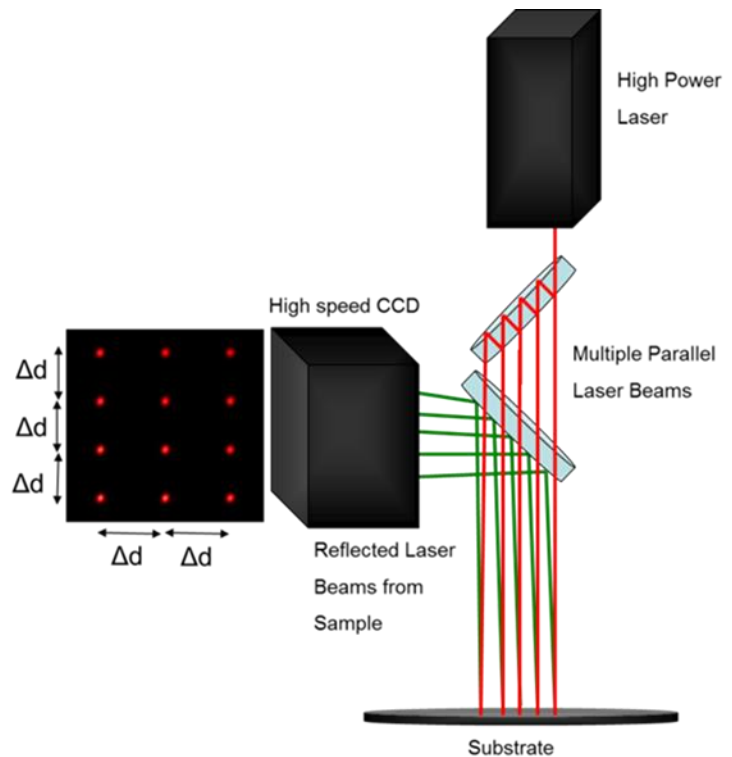




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Product Description

Leveraging k-Space Associates' expertise in integrating critical thin film metrology equipment, the MOS Thermal Scan system utilizes the patented MOS (Multi-beam Optical Sensor) stress measurement technology to provide unparalleled curvature, stress, and bow height accuracy, resolution and repeatability. The system is configured with a high performance vacuum process chamber utilizing advanced rapid thermal annealing heaters and quartz sample holder to maintain wafer temperature stability and uniformity across the entire rated temperature range from room temperature to 1000°C. The high-resolution, sub-micron linear scanning stage ensures accurate, user programmable 2D scanning on samples up to 200mm diameter. Measurements can be performed at stabilized temperatures using 2D scans or during thermal cycling processes using rapid data acquisition at a single wafer point to ensure accurate stress information is obtained. Measurements can be made during introduction of forming or other gas, with two gas introduction lines included in the standard product configuration. Gas control is accomplished with manual set point flow meters and software controlled solenoid On/Off valves. Patented multiple-spot laser array and auto-intensity feedback control ensures kSA MOS technology is compatible with substrates having a wide variation in surface reflectivity.



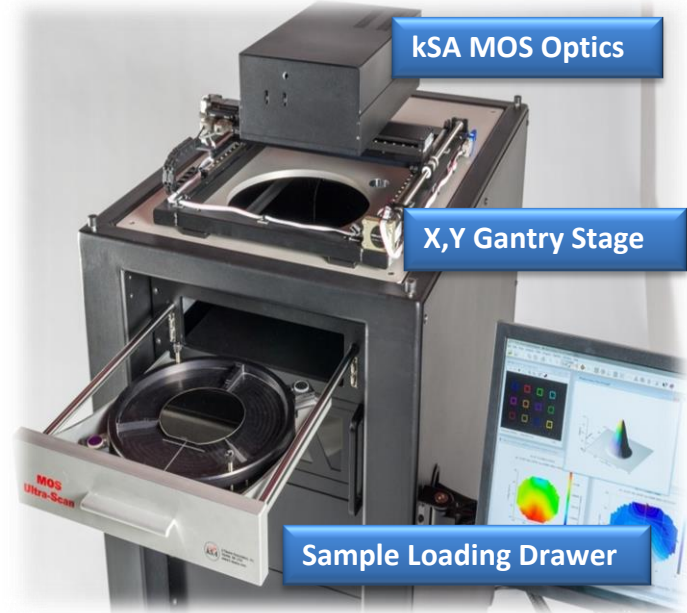
**Patented kSA MOS 2D Laser Spot Array
used for Curvature/Stress Measurements**



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Equipment Configuration and System Specifications

The vacuum heating chamber utilizes patented rapid thermal annealing technology in a completely integrated system with circulated water cooled chamber, vacuum compatible sample compartment with sample locating features, and integrated thermocouple. Easy sample loading and unloading is accomplished via pull-out drawer. The heating is performed with a high uniformity quartz halogen lamp array for maximum temperature uniformity and stability. The system is capable of heating substrates to 1000 °C under vacuum.



General System Specifications

- Maximum substrate size: Holds up to 200mm diameter wafer with provisions for 150mm and 100mm samples.
- Substrate heater temperature range: RT to 1000°C
- Integrated gas introduction lines with manual flow meter and software-controlled on/off valves. Compatible with forming, oxide, or inert gas use during heating.

Vacuum Chamber

- Water-cooled rapid thermal annealing chamber with O-ring sealed front loading chamber, sample holder, and upper full area viewport to facilitate 2D curvature scanning over 200mm samples.



Vacuum heating chamber for up to
200mm diameter wafers.

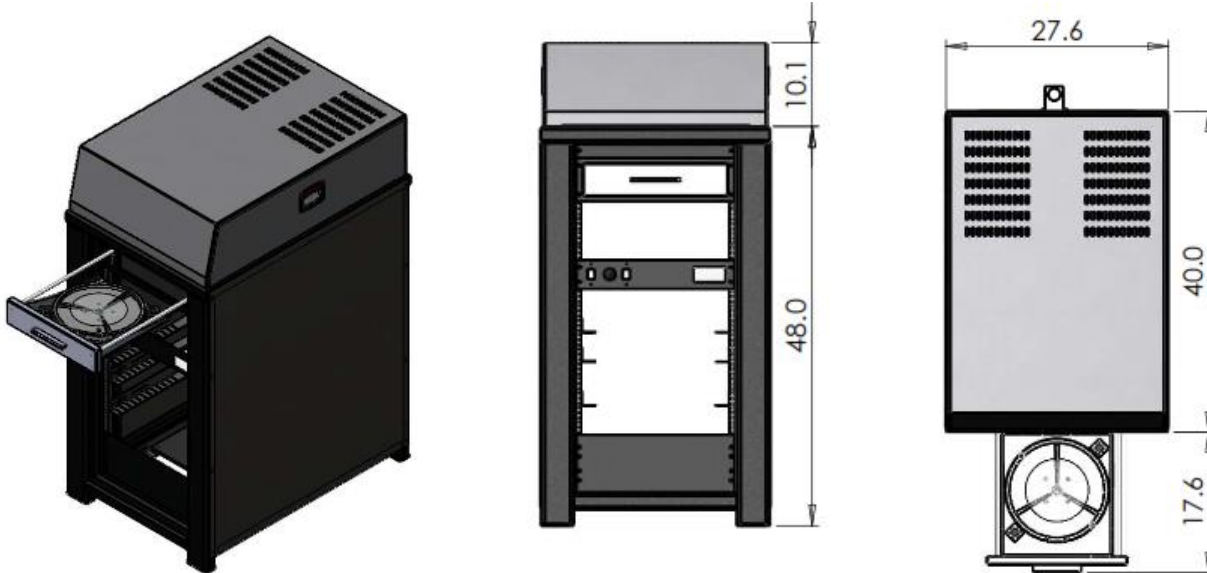


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Frame Assembly:

- A robust steel frame houses the entire chamber, control electronics, vacuum pump and metrology system.
- The frame has retractable castors so that the system rests on vibration isolation pads.



Pumping:

- Diaphragm backing pump with all related manual isolation, control valves, and pump controllers are fully integrated to achieve 750 mTorr base pressure or better.
- Vacuum gauging includes one gauge with digital readout and process pressure setpoint relay for safety interlock control.

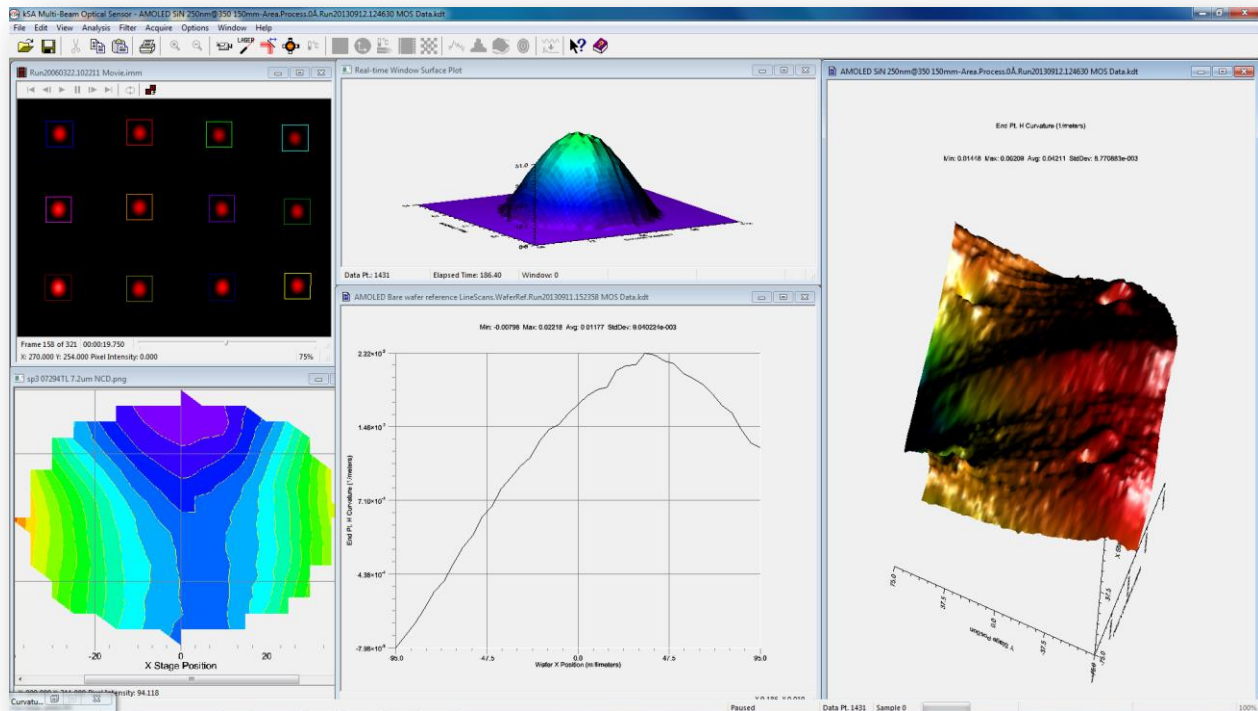
Substrate Heater and Temperature Control

- All substrates are free standing with integrated thermocouple.
- Heater is of patented crossed-array quartz halogen lamp design, with bottom heating elements for maximum substrate temperature uniformity and stability.
- Substrate temperature will be controlled via a programmable closed-loop temperature control unit and power supply.
- Temperature uniformity: better than $\pm 2^{\circ}\text{C}$ across central 80% of sample.
- Temperature measurement accuracy is dictated by standard thermocouple accuracy.



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MOS Hardware and Software



- Complete kSA Multi-beam Optical Sensor (MOS) System for measuring wafer curvature, wafer bow, and thin-film stress
- Patented laser array technology provides full 2D curvature and stress information
- Configurable scan resolution parameters
- Integrated scanning stage to allow for 2D scanning of up to a 200mm sample through optical viewport at stabilized temperatures, and center point during ramping of temperature.
- Patented, Automated Mirror Tracking with Servo Control and auto-intensity laser control ensures kSA MOS signal continuity during thermal expansion effects, surface reflectivity changes, and large variation in curvature/tilt during thermal cycling
- **Resolution:** $1e-5$ (1/m) 1-sigma static curvature (100km radius) at room temperature with better than $5e-5$ (1/m) (20km radius) resolution at high temperature.
- **Curvature Accuracy:** Better than 0.5%
- **Curvature Repeatability:** $<2 \times 10^{-5}$ (1/m) 1 sigma

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- Thirty (30) 2-D curvature/stress measurements per second (maximum rate) when acquiring data at center point of wafer. Slower data rates are fully programmable.
- Thermal scan software to provide fully automated multi-segment ramp/soak recipe control for annealing studies. Curvature and stress can be monitored and plotted as a function of temperature and time. Up to 100 cycles.
- Complete data storage, including full digital movies of the laser array that can be re-analyzed or incorporated into presentations
- Complete publication quality graphics and color display
- Export of all data to Windows Excel format or ascii text file.

Computer Specifications (Minimum):

- Model: 4U Rack Mount Server Case
- O.S.: Windows 7 Professional 32/64bit
- Optical Drive: None (optional)
- Processor: Intel i5 Quad Core Series Processor
- Graphics: Sapphire Radeon HD 5450 1GB DDR3
- Hard Drive: 1TB 7200rpm 6.0Gb/s
- Memory: 4GB (2 x 2GB) DDR3 1600 SDRAM
- 22" LCD flat panel display on frame-mounted arm with keyboard and mouse platform

Warranty

All kSA systems and integrated components are warranted against defective materials and workmanship for a period of ONE YEAR from the date of delivery to the original purchaser.

Installation and Training

Two days of on-site customer installation and training are included in proposal pricing.

Customer Facility Requirements

- Input electrical power is 230/240 VAC, 3 phase plus ground.
 - Each phase must have 230 VAC and 30 Amps.
- Customer will provide an exhaust for the vacuum pump and for the chamber - two separate lines. kSA will provide details on standard connection types used.



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- Full facilities documentation to be provided upon order placement
- All safety considerations will be provided by k-Space in the kSA MOS Thermal Scan User Manual.
- k-Space uses all CE marked components.