



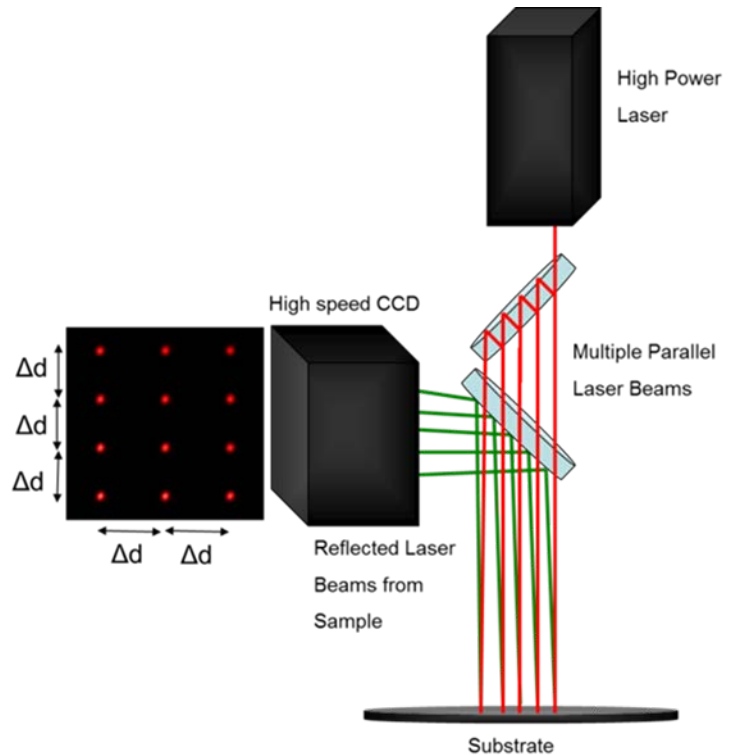
Model MOS-TS300-MT-2D



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 600°C. The high-resolution, 300mm x,y gantry stage ensures accurate, user programmable area and line scans on samples up to 300mm diameter.

Measurements can be performed at stabilized temperatures using 2D scans or during thermal cycling 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, digital readout 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.

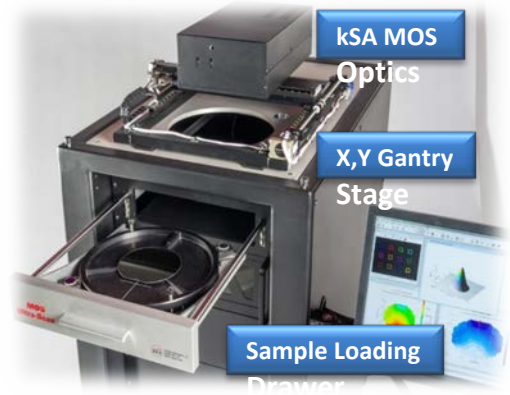


Patented kSA MOS 2D Laser Spot Array used for Curvature/Stress Measurements



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 crossed quartz halogen lamp array for maximum temperature uniformity and stability. The system is capable of heating substrates to 600 °C under vacuum or process gas environments.



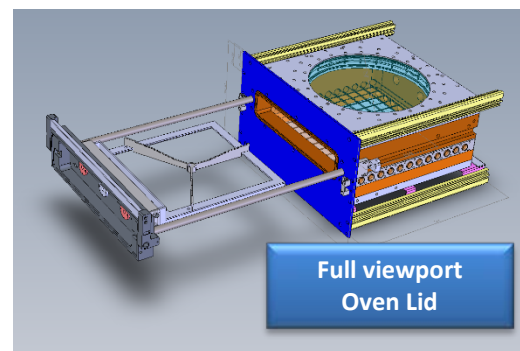
General System Specifications

- Maximum substrate size: Holds up to 300mm diameter wafer with provisions for 50mm, 100mm, 150mm, 200mm and 300mm samples. Smaller samples can be held with a graphite susceptor plate (quoted separately).
- Substrate heater temperature range: RT to 600 °C
- Process gas introduction lines with manual flow adjust, digital readout and software-controlled solenoid on/off valves. Compatible with forming gas, oxide, or inert gas use during heating.



Vacuum Chamber

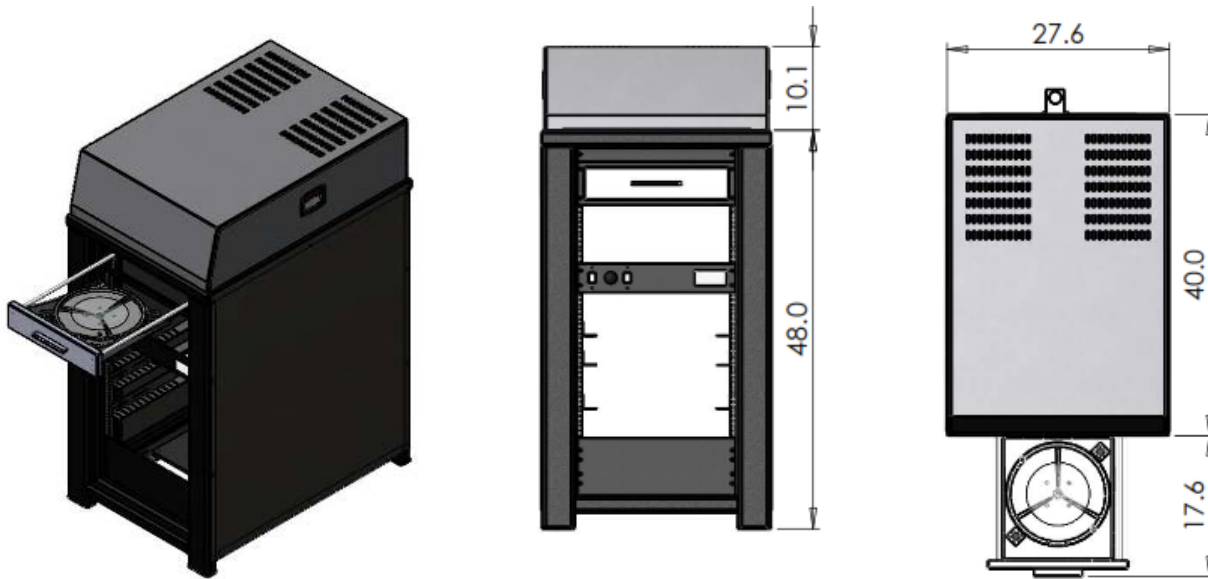
- Water-cooled rapid thermal annealing chamber with O-ring sealed front loading chamber, sample holder, and full upper quartz viewport to facilitate either line-scan, area scan or single-point curvature measurements for wafers up to 300mm diameter.





Frame Assembly:

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



Substrate Heater and Temperature Control

- Substrates are free standing with integrated thermocouple.
- Heater is a 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 when measured with sample at stable temperature.
- Temperature measurement accuracy is dictated by standard thermocouple accuracy.

Vacuum/Pumping:

- Vacuum gauging includes one gauge with digital readout and process pressure setpoint relay for safety interlock control.
- Diaphragm backing pump with all pump controller are required and may be supplied by customer or by k-Space. System included related manual isolation, control valves, and can be fully integrated to achieve 750 mTorr (~ 1 mbar) base pressure or better.

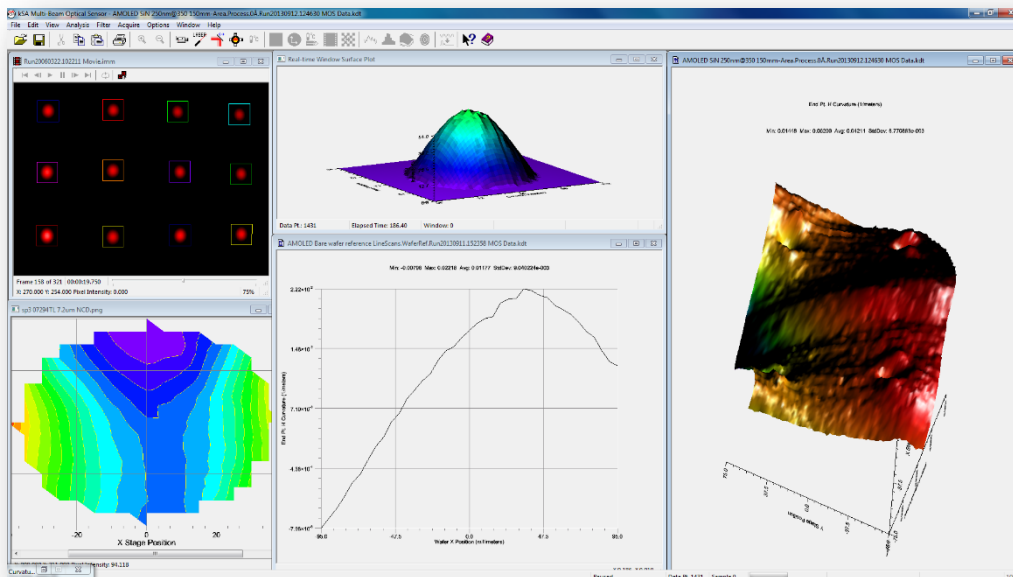


Optional Cryogenic Cooling (-COOL)

- Cryogenic N2 cooling is available upon request to provide fully automatic temperature control to -35 °C
- Utilizes a point of use Polycold® Gas Chiller (PGC) to cool compressed dry nitrogen to cryogenic temperatures on demand.
- Includes fully automated flow controller and two software controlled cryogenic solenoid valves
- Allows for faster sample cooling and low temperature measurements
- Additional Installation time required



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 at each measurement site
- Configurable scan resolution parameters



- Integrated scanning stage to allow for line scans and full 2D area scans of up to 300mm samples 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: 2×10^{-5} (1/m) 1-sigma static curvature (50km radius) at room temperature with better than 5×10^{-5} (1/m) (20km radius) resolution at high temperature.
- Curvature Repeatability: $< 2 \times 10^{-5}$ (1/m) 1- sigma
- 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.
- Offline analysis available with supplied Analysis Only software license.

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 6450 1GB DDR3
- Hard Drive: 1TB 7200rpm 6.0Gb/s
- Memory: 8GB (2 x4 GB) 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.

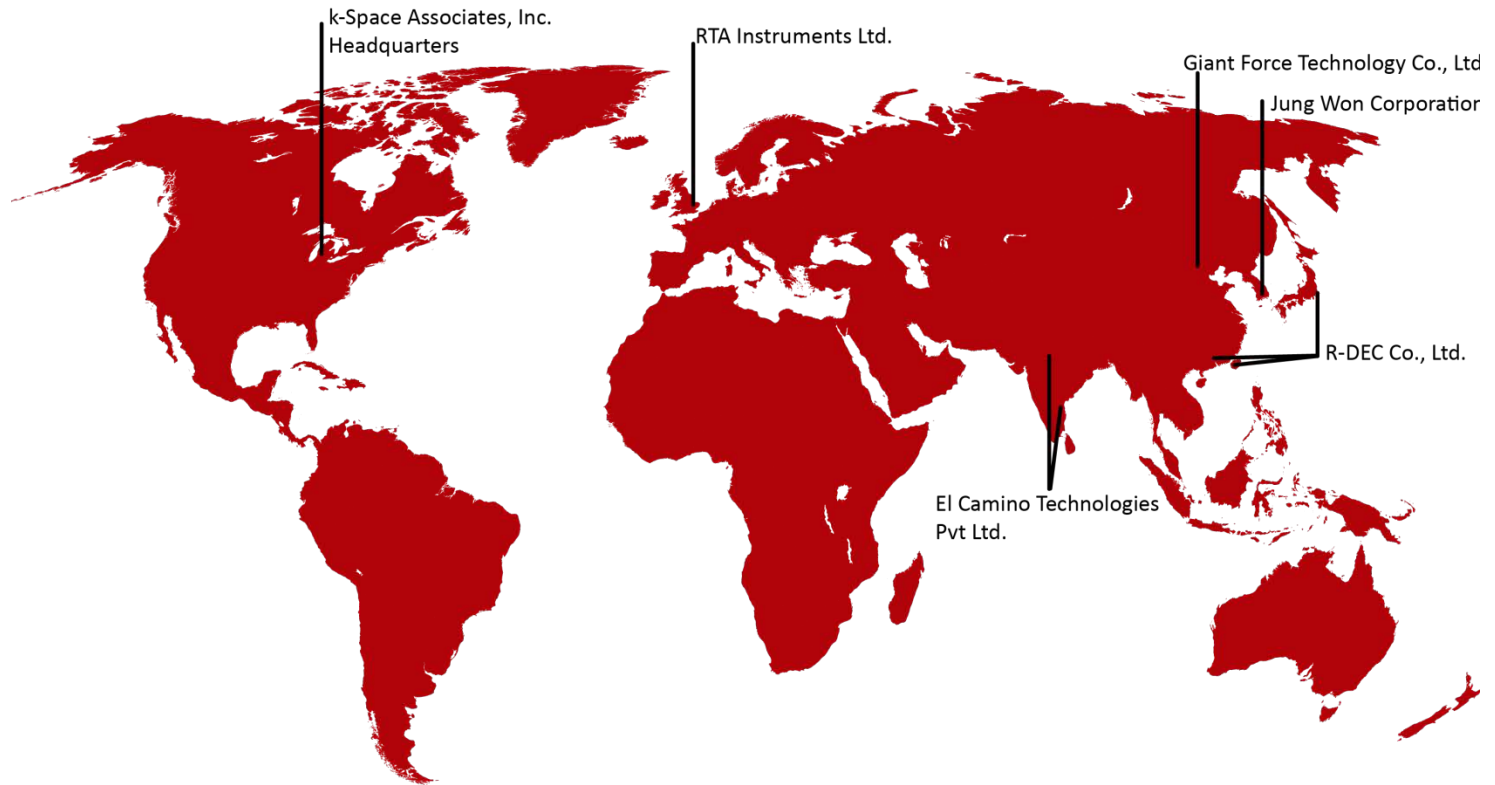


Installation and Training

A minimum of five days of on-site customer installation are required. Additional on-site support for tool training suggested. Any customer defined tool acceptance criteria will need to be approved by k-Space prior to tool purchase and additional on-site service for on-site acceptance testing is required.

Customer Facility Requirements

- Cooling Water: Approximately 15 L/min, pressure differential 2-3 bar, stable incoming temperature 15°C-18°C, Two ½" Swagelok fittings provided for both the inlet and outlet connections
- Vacuum Connection: KF25 flange provided, requires 2.8 m³/h
- Exhaust Connection: KF40 flange provided, requires 60 m³/h
- Process Gas connections: Two ¼" Swagelok connections provided for room temperature Nitrogen or Argon process gas connections
- Power: RTP furnace power supply requires 3 x 230 V (3 Phases with neutral) in star connection (460V phase to phase). As part of the tool price k-Space provides 240V 1-phase UPS for backup of critical components such as CPU, gantry stage power and optics head power. The RTP furnace is NOT typically on backup power. A 5-wire, 3- phase UPS may be used to provide backup power to entire system (including RTP furnace) if supplied by the customer.
- All safety considerations will be provided by k-Space in the kSA MOS Thermal Scan User Manual.
- k-Space uses all CE marked components.



k-Space has an expansive network of distributors to best serve our worldwide customer base.

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