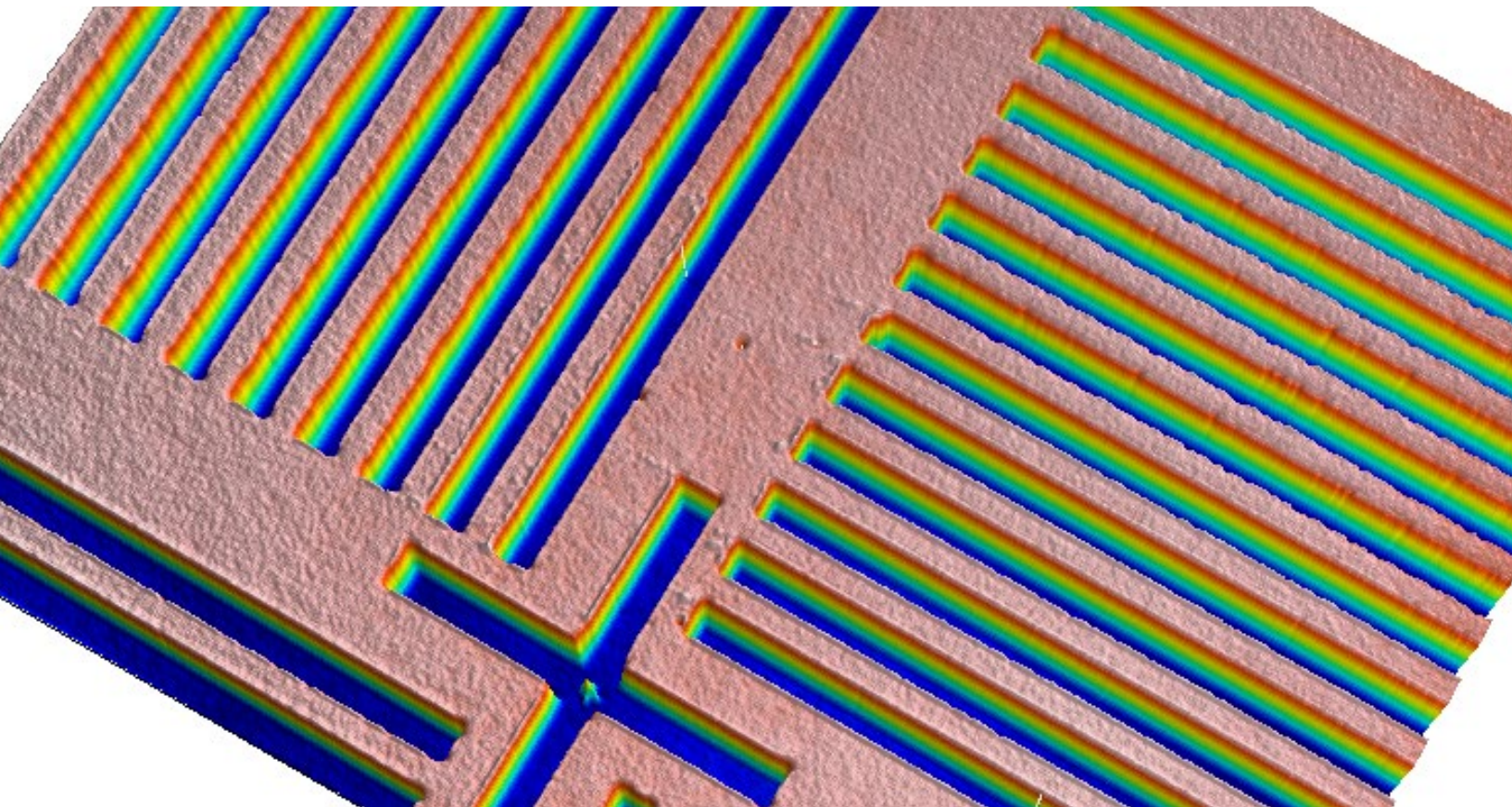


Tencor™ P-17

Stylus Profiler



Advantages

- Excellent repeatability and reproducibility
- Measures up to 200mm scan length without the need for stitching
- Direct, material-independent measurements
- Automatically maintains the applied force regardless of the feature height
- Pattern recognition enables automated measurements, increasing productivity
- Supports SECS/GEM requirements for automated sequencing, results reporting, and recipe database control

Applications

- High resolution 2D and 3D scanning of surface topography
- Step heights from nanometers to 1mm
- Roughness and waviness of smooth and rough textures
- Bow and radius of curvature
- Thin film stress using Stoney's equation
- Defect characterization using KLARF files and the Defect Review application

Tencor™ P-17 Stylus Profiler

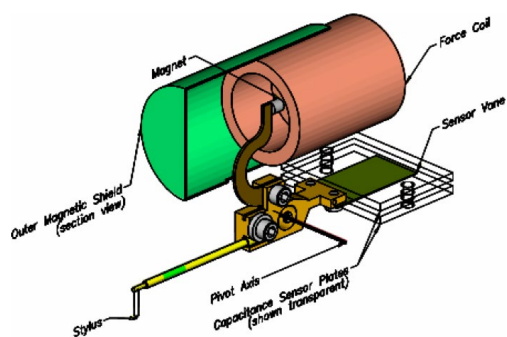
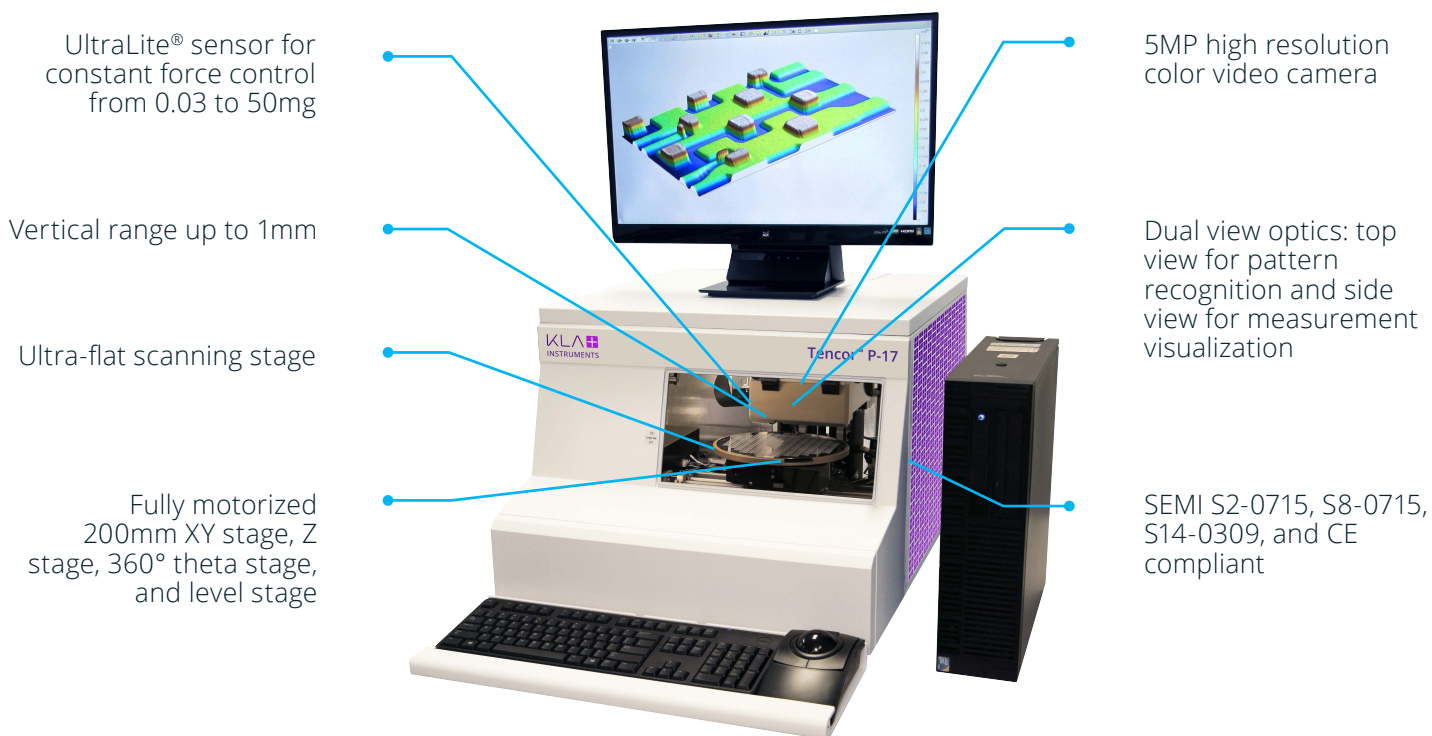


The Tencor P-17 is the eighth generation of the P-series stylus profilers, building on over 40 years of profilometry expertise. The system offers a programmable scan stage, low noise, and sub-angstrom electronic resolution throughout the vertical range, enabling high resolution scans across the entire sample surface.

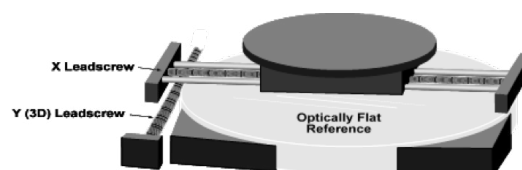
The P-17 benefits include a 200mm scan stage for measurement of the entire substrate without the need to stitch. An UltraLite® sensor assembly combines a large, linear vertical range with constant force control to measure a wide variety of materials and topographies. Top and side view optics enable easy site teaching, pattern recognition, and visualization of the stylus during a measurement.

The P-17 combines automation with high reliability for addressing production applications where a wafer handler is not required. These applications include step height, roughness, and stress metrology for AlTiC, GaAs, Si, SiC, and sapphire wafers for use in semiconductors, power devices, wireless, LED, and data storage.

Features and Options Overview

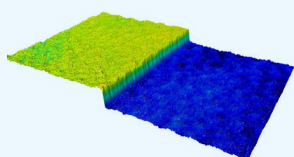


Linear Variable Differential Capacitor (LVDC) design generates no heat or friction



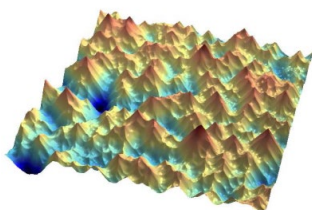
Optical reference flat and decoupled leadscrew motion achieve ultra-flat scans, improving measurement precision

Applications



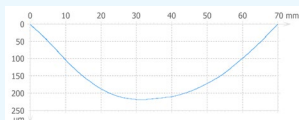
Step Height

Measure 2D and 3D step heights from nanometers to 1mm, depending on the sensor assembly dynamic range. Quantify the material deposited or removed during etch, sputter, SIMS, deposition, spin coating, CMP and other processes.



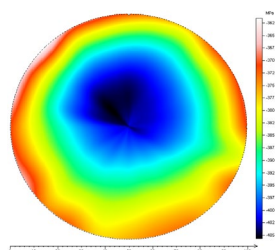
Texture: Roughness and Waviness

Measure 2D and 3D texture while quantifying the sample's roughness and waviness. Distinguish between roughness and waviness components using software filters and calculate parameters such as the root mean square (RMS) roughness.



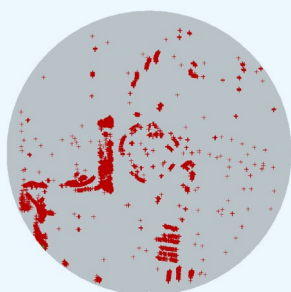
Form: Bow and Shape

Measure the 2D shape or bow of a surface, including wafer bow resulting from layer stress mismatch during the device fabrication process, such as deposition of multiple layers in the production of semiconductor or compound semiconductor devices. Quantify the height and radius of curved structures, such as a lens.



Thin Film Stress

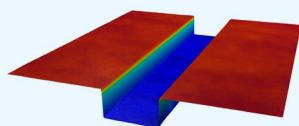
Measure 2D and 3D stress induced during the manufacture of semiconductor or compound semiconductor devices having multiple process layers. 2D stress mode uses a single scan across the sample diameter whereas 3D stress mode rotates the theta stage between 2D scans to measure the full sample surface.



Defect Review

Measure the topography of defects, such as the depth of a scratch. Import KLARF location coordinates from a defect inspection tool to automatically navigate to a specific defect. Select individual defects for 2D or 3D measurement using the Defect Review application.

Broad Range of Industries



100nm GaAs Gate Etch Depth

Semiconductor and Compound Semiconductor

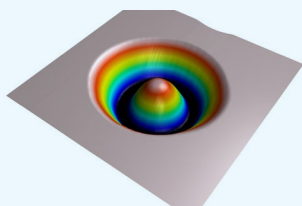
Measure surface topography for front end through back end and packaging processes. These applications include the measurement of photoresist thickness, etch depth, sputter height, post-CMP topography, roughness, sample bow and stress. Measurement precision is optimized using pattern recognition and automated analysis for improved production process control.



MESA Step Height

LED and Power Devices

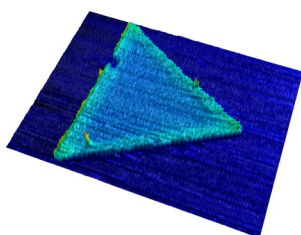
Measure step heights for patterning processes including MESA step height, ITO step height, and contact depth. Measure substrate roll off, bow, epitaxial roughness, and epitaxial thin film stress that can lead to cracks and defects. Use the Defect Review application to distinguish between a nuisance or a killer defect.



Microlens 3D Profile

MEMS and Optical Electronics

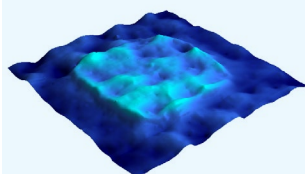
Measure step height, radius of curvature and 3D topography for macro and micro lenses. Measure etch depth and surface roughness for wave guide and dense wavelength division multiplexing (DWDM) structures.



Slider CMP

Data Storage

Characterize thin film head wafers and sliders, hard disks, and optical and magnetic media. Wafer applications include plating thickness, coil heights, and CMP planarity. Slider applications include pole-tip recession analysis, air bearing cavity measurement, and laser texture bump characterization that includes bump height, width, and depth analysis.

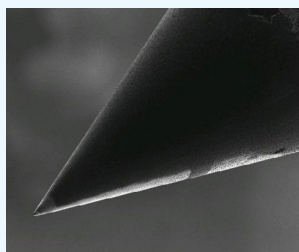


Topography of a Touch
Screen Bump

General Purpose Applications

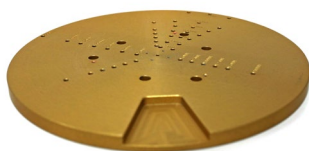
Use the P-17 stylus profiler in a wide range of industries for production or R&D. Examples include measurement of textile security features or roughness correlating to absorbency. Biomedical examples include the measurements of catheter surface texture, medical stent reservoir depth, and the topography of metal cardiac implants. Consumer electronics applications include measurement of touch screen topography or measurement of thin film step heights on glass screens.

Hardware Features



Stylus Options

The P-17 offers a variety of styli to support the measurement of step heights, high aspect ratio steps, roughness, sample bow, and stress. The tip radius ranges from 40nm to 50µm and determines the lateral resolution of the measurement. The included angle ranges from 20 to 100 degrees and determines the maximum aspect ratio of the measured feature. All styli are manufactured from diamond to minimize stylus wear and increase stylus lifetime.



Sample Chucks

The P-17 has a range of chucks available to support multiple applications. The standard is a universal vacuum chuck with precision locating pins for samples from 50 to 200mm. The universal chuck supports bow and stress measurements using 3-point locators to support the sample in a neutral position for accurate bow measurements. Additional options for solar samples, HDD disks, and precision sample location plates are available.



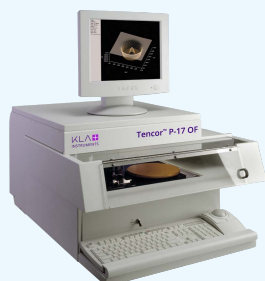
Isolation Tables

The P-17 offers both tabletop and free-standing passive isolation options. The tabletop Granite Isolator™ Series combine granite with high grade silicone gel; the Onyx Series tabletop isolation systems use pneumatic air isolators, and the TMC 63-500 Series isolation tables consist of a free-standing steel frame table with pneumatic air isolators.



Step Height Standards

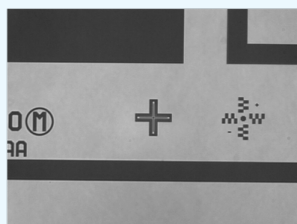
The P-17 uses thin and thick film NIST-traceable step height standards offered by VLSI Standards. The standards feature an oxide step on a silicon die mounted on a quartz block, or an etched quartz step with a chrome coating. Available step height standards range from 8nm to 250µm.



Large Sample Configuration

The Tencor P-17 OF (Open Frame) has the same capability as the P-17, but with a larger frame to allow loading of larger samples. The system can be configured for 300mm wafers, or with a 240 x 240mm chuck.

Software Features

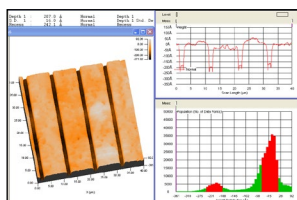


Optimized for Production Applications

The P-17 delivers the advanced performance and measurement precision required for R&D in a production-ready configuration. Fully automated, multi-site sequencing reduces the impact of operator error, resulting in enhanced measurement stability.

- Pattern recognition automatically aligns the sample
- Feature Detection automatically measures up to 30 steps in a single scan
- SECS/GEM communications for remote control and results reporting to host SPC systems

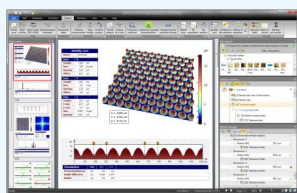
Comprehensive Analysis Suite



The P-17 software supports data analysis and recipe generation either on the system or on an offline computer.

- 2D and 3D step heights with cursors and histogram analysis
- 2D profiles and 3D views of the measurements
- 2D and 3D roughness and waviness analysis
- 2D and 3D filtering and leveling techniques
- Thin film stress and sample bow calculation

Apex Software



The Apex software platform extends the analysis and reporting capabilities of the P-17 system. Apex is fully integrated into the profiler software, with a simple and intuitive format that allows for easy creation of customized reports and automatic processing of data.

- Multiple language support
- Advanced filtering, leveling and analysis functions
- Over forty surface parameters including slope, flatness, bearing ratio and volume
- Extensive suite of roughness parameters supporting ISO, ASME and additional region-specific standards
- Histogram of the surface topography, including peak count distribution
- Annotation and pass/fail criteria on documents

Optical and Stylus Profilers

Measure the topography of any surface with our range of benchtop and automated wafer handling optical and stylus profilers. Find out more at kla.com/profilers.



Profilm3D®
Profilm3D-200



Zeta-20



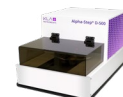
Zeta-300, Zeta-388



Tencor™ P-170
HRP®-260



Tencor™ P-7,
P-17, P-17OF



Alpha-Step® D-500
Alpha-Step® D-600



KLA SUPPORT

Maintaining system productivity is an integral part of KLA's yield optimization solution. Efforts in this area include system maintenance, global supply chain management, cost reduction and obsolescence mitigation, system relocation, performance and productivity enhancements, and certified tool resale.

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