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Tencor P-10 Surface Profiler



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The Tencor® P-10 Surface Profiler provides high precision surface topography measurements on a wide variety of substrates. The system's exceptional performance features, flexible sample handling and powerful software capabilities make it the best choice for development engineering and research applications.

The P-10 features Tencor's Standard Range MicroHead measurement head, which offers fast scan speeds for high throughput, a constant stylus force throughout the measurement range for superior stylus control, and improved 3-D imaging.

With its stand-alone computer and powerful software, the Tencor P-10 can quickly characterize step heights, roughness, waviness, process-induced stress, radius of curvature and a range of geometric features. Two-dimensional traces and three-dimensional displays provide additional information critical to understanding surface conditions.

To meet a variety of development and process engineering requirements, the Tencor P-10's measurement chamber is designed to accommodate components of various forms and sizes including standard-sized semiconductor wafers, thin film disk heads, hybrids and other substrates.

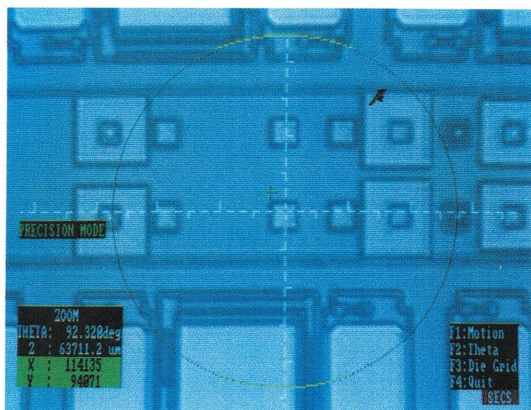
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A cross-hair in the video image view facilitates stylus positioning over the smallest features.

Roughness and waviness components can be separated and presented in a single display with other key data.

Precision Profiling

The Tencor P-10 offers a guaranteed step height repeatability of 8\AA (1σ), allowing it to precisely determine the thinnest step heights, surface microroughness, microwaviness and overall form error on thin film coatings.

Tencor's state-of-the-art profiling technology ensures this guaranteed performance with ultra-low noise electronics, precision mechanical components, and exceptional measurement stability.

Accuracy on Soft Surfaces

With the optional MicroHead II measurement head—which offers stylus forces as low as 0.05 mg—the Tencor P-10 can provide accurate measurements even on soft surfaces such as indium, gold or photoresist.

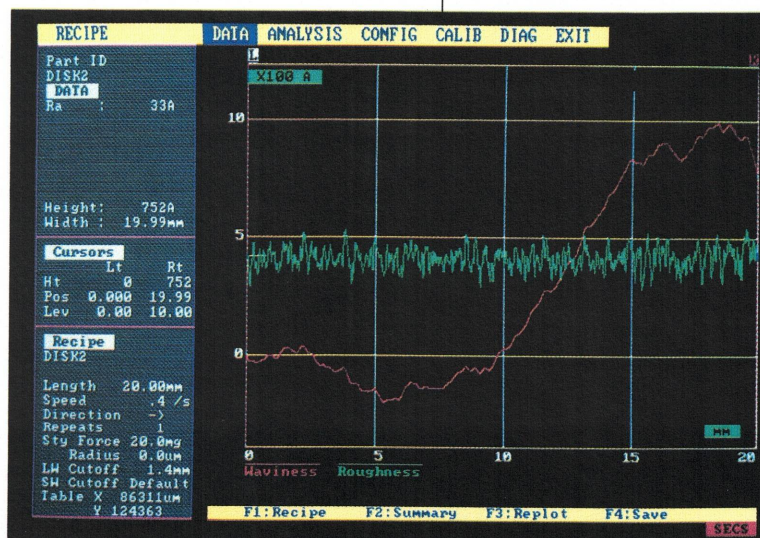
The MicroHead II also offers dual-view optics, allowing operators to automatically switch between a top down view for fast stylus positioning, and an angled view for easily monitoring the stylus as it scans over the desired feature.

Flexible Sample Handling

The Tencor P-10 accommodates a variety of substrate sizes, shapes and weights. Samples as large as 254 x 254 mm and as thick as 63 mm can be easily measured. Two pre-programmed stage locations facilitate sample loading and unloading, while a *Motorized Theta and Leveling* option allows precise rotation of the sample up to 360 degrees. Once the sample is loaded, the stylus can be positioned anywhere in a 150 x 150 mm area using the motorized stage.

Specific features can be quickly located using the high-resolution video monitor, which magnifies the sample up to 1200 times (in the top down view) and displays a cross-hair indicating the stylus location in relation to the sample.

For measuring features with a high vertical range, such as the curvature of a spherical lens or magnetic tape heads, an optional Extended Range MicroHead is available, providing a vertical range of 1000 μm —more than three times that of the Standard Range MicroHead or MicroHead II.



Fast, Comprehensive Analysis

The Tencor P-10's proprietary software simplifies system operation with pull-down menus, pop-up windows and fast on-screen commands.

All key parameters—such as scan length, speed, vertical resolution, stylus force, stylus descent rate, leveling and measurement cursor positions—can be programmed into a measurement “recipe” tailored for a specific application. The recipe can then be saved for repeated use by different operators. Recipes are stored with the measurement data for further analysis.

A bandpass filter function quickly separates raw data into roughness and waviness components which can be displayed simultaneously. 31 key parameters provide detailed analysis of surface parameters, including:

- Roughness
- Waviness
- Step height
- Area
- Slope
- Radius of curvature
- Profile length.

In addition, a *Database Manager/Import* feature allows data to be saved and retrieved according to multiple, user-defined categories such as production site, equipment, operator, process, time and other factors.

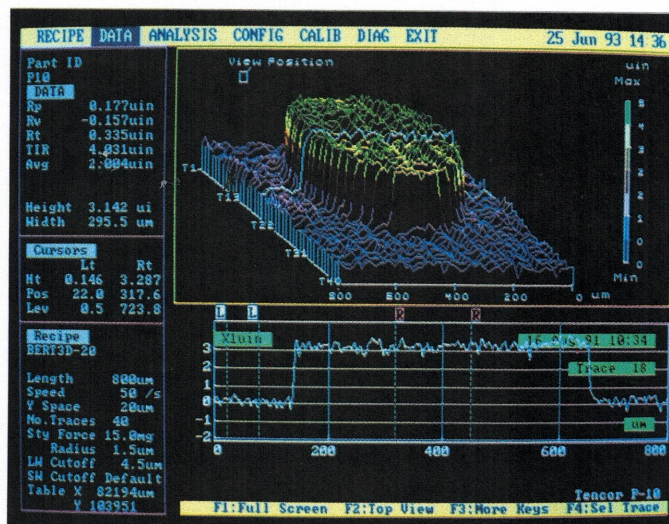
Powerful Software Options

A number of useful software options can be added to the Tencor P-10 to meet the needs of specific applications.

The *Additional Surface Roughness Parameters* option adds powerful in-depth analysis capabilities to the P-10.

The total number of surface parameters is increased to 40 with the addition of the following functions:

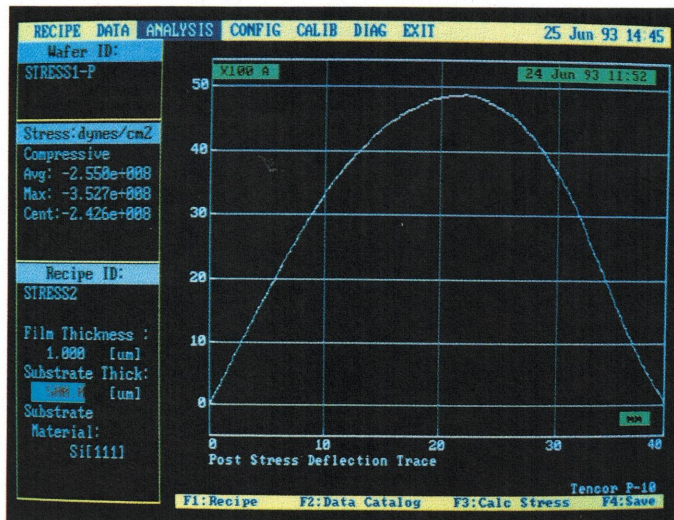
- Bearing ratio (tp)
- Cutting depth (CutDp)
- Peak count (Pc)
- High spot count (HSC)
- Mean peak spacing (Sm)
- Mean peak height (Rpm)
- RMS slope and wavelength (Dq and Lq)
- Standard deviation of heights (SD)



Three-dimensional and selected two-dimensional data can be displayed on one easy-to-read screen.

User selected parameters can be programmed into a *Recipe* tailored for the specific application.

RECIPE SEQUENCE DATA ANALYSIS CONFIG CALIB DIAG EXIT				11 Aug 95 09 42	
RECIPE					
Recipe ID		: SL-ETCH	Vertical Units		: Metric
Recipe Type		: 2D	V. Range/Resol.		: 130um/100
Horizontal Units		: Metric	Profile Type		: 7L
Scan Length		: 200 um	V. Display Scale		: Auto
Scan Speed		: 20 um/s			
Scan Time		: 10 sec			
Sampling Rate		: 200 Hz	Graph		: Raw Data
Horiz. Resol.		: 0.10 um	Long Wave Cutoff		: OFF
Direction		: ->	Short Wave Cutoff		: Default
			Fit & Level		: Off
Multi-Scan Avg		: 1 [1-10]			
Segmented		: No	Cursors: RELATIVE um		Left Right
			Measurement		: 20.00 100.00
			Leveling		: 20.00 100.00
			Delta Meas Width:		: 10.00 10.00
			Delta Level Width:		: 10.00 10.00
Stylus Force		: 1.00 mg			
Contact Speed		: 3			
Radius Required		: 2.0	Surface Parameters		View
F1:Save F2:Recall F3:Cursors F4:Quit					



Pre- and post-stress profiles are used to calculate process-induced stress.

The Tencor P-10's low noise design and unique MicroHead measurement head ensure the precise and repeatable measurements required to create accurate three-dimensional images of the surface. The *Interactive 3-D* option allows surface artifacts such as defects, pits or scratches to be displayed. The software is highly interactive and provides unique zoom functions for closer inspection.

The *Stress Measurement* option accurately calculates process-induced film stress. A pre-stress scan is taken and saved prior to the process step selected for analysis. After processing, a post-stress trace is taken and the resulting difference trace shows the film stress created during the processing step. Average, maximum and center stress can be measured in dynes/cm² over a 60 mm scan length.

Selected Specifications

Scan Length: 60 mm (2.3")

Standard Stylus Force

Standard Range MicroHead: 1.0 - 50 mg,
0.1 mg resolution

Low Force Option

MicroHead II: 0.05 - 50 mg,
0.05 mg resolution

Extended Range Option

Extended Range MicroHead: Vertical range up
to 1000 μ m

Step Height Repeatability, 1 σ *

8 Å maximum in the 13 μ m (± 6.5 μ m) range

Maximum Sample Size

254 x 254 mm (10 x 10")

355 x 355 mm (14 x 14") with side panel removed

Physical Characteristics

Height(w/o monitor): 46 cm (17.5")

Width: 57 cm (23")

Depth: 78 cm (31")

Weight: 68 kg (150 lb)

Power Requirement: 150 VA

(For complete specifications see the
Tencor P-10 specification sheet.)

*Measured 10 times at one position on a 9400Å VLSI Standard step height at 10 mg stylus force.

Specifications subject to change.



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