KLA-Tencor

Production Series

METROLOGY

P-170 Automated Stylus Profiler

KLA-Tencor's P-170 automated stylus profiler builds on the success of the P-17 and HRP products, market leaders in the semiconductor, compound semiconductor, LED, and data storage markets. The P-170 is the combination of the proven performance of the P-17 and the handler from the HRP, plus enhancements for speed, pattern recognition, and recipe transportability. The result is the best price-to-performance for an automated stylus profiler available for pilot lines to full production facilities.

The P-170 features industry leading step height repeatability due to superior sensor and scanning stage design.

	Steps ≤ 1 µm	Steps > 1 µm
Repeatability[1]	4 Å	0.10%
Reproducibility[1]	15 Å	0.25%

1. Repeatability is static measurements, no sample load/unload between measurements. Reproducibility is dynamic measurement, sample load/unload between measurements. All measurements are defined as standard deviation, one sigma of 15 trials using best known methods on a well-defined step height.

The P-170 utilizes the production proven open cassette handler from the HRP, including support for transparent substrates such as sapphire.

	Standard	Optional
Cassette Stations	Single	Dual
Sample Size	200 mm	75, 100, 125, and 150 mm
Sample Aligner	Opaque samples with notch or flat	Transparent samples with notch or flat
Throughput[2]	12 Wafers per Hour	15 Wafers per Hour

2. Throughput is defined as 5 measurement sites, using a 2D production recipe (scan time < 10 seconds), with single deskew, measuring 25 wafers per lot, using optimized recipe settings.

The UltraLite® sensor is a linear variable differential capacitive (LVDC) sensor with the lowest mass, lowest noise, and highest resolution of any sensor available. It is the only sensor technology with constant force control over the entire vertical range.

	Standard	Low Force	Extended
Total Dynamic Range	327 µm	131 µm	1000 µm
Vertical Resolution	0.01 / 0.04 / 0.20 Å low / mid / high range	0.01 / 0.02 / 0.10 Å low / mid / high range	0.01 / 0.08 / 0.60 Å low / mid / high range
Stylus Force	0.5 – 50 mg	0.03 – 50 mg	0.5 – 50 mg
Force Control	constant	constant	constant
Vertical Linearity[3]	± 0.5% > 2000 Å 10 Å ≤ 2000 Å	± 0.5% > 2000 Å 10 Å ≤ 2000 Å	± 0.5% > 2000 Å 10 Å ≤ 2000 Å
Sampling Rate	5 to 2000 Hz	5 to 2000 Hz	5 to 2000 Hz

3. Vertical linearity is measured by the maximum non-linearity component divided by the vertical range.

The P-170 offers a 200 mm scan length with no stitching required.

	2D Scanning	3D Scanning
Maximum Scan Length	200 mm – no stitching required	any rectangle inscribed within a 200 mm diameter circle
Lateral Resolution	0.025 µm	0.5 µm
Maximum Points per Scan	1 million	4 million
Scanning Speed	2 µm/sec to 25 mm/sec	-

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The P-170 has superior scan flatness for excellent short scan, long scan, and stress measurement performance.

	Specification
Scan Flatness[4]	20 nm over 0.5 mm scan
	30 nm over 2 mm scan
	40 nm over 30 mm scan
	75 nm over 60 mm scan
	170 nm over 130 mm scan
Bow Repeatability	0.1%
Stress Repeatability	2.5%

4. Scan flatness tested with 150 mm, 1/20 optical flat. Bow repeatability tested with a 20 m radius mirror. Contact KLA-Tencor for optimized recipe conditions.

The P-170 includes the following motorized stages standard:

	Stage Specifications
XY Stage Repeatability[1]	2.0 µm (static) 2.5 µm (dynamic)
Z Stage	65 mm range
	optical approach sensor
Theta Stage	± 360° at 0.1° resolution
Level	± 3°

The P-170 with the microhead V offers high resolution, in-line top and side view optics, with optical zoom.

	Optics Specifications
Top View: FoV	1400 x 1400 µm
Side View: FoV	850 x 1200 µm
Camera	4.9 MP, color
Zoom	3.5x, optical

The P-170 offers a full range of styli, plus custom designs:

	Radius	Angle
Standard	2 – 50 µm	60°
Submicron	0.2 µm	> 90°
High Aspect Ratio	0.04 - 2 µm	20 – 45°

The P-170 chuck is designed for automatic wafer loading for 75, 100, 125, 150, and 200 mm wafers.

	Chuck Specifications
Standard	wafer vacuum chuck
Optional	auto-load stress chuck

The P-170 complies with the latest industry standards:

	Industry Standards
CE Certification	self-certified
SEMI Standards	S2-0715 and S8-0715
RoHS	computer and peripherals

P-170 computer specifications (minimum):

	Computer
Processor	2.9 GHz quad core
RAM	8 GB
Hard Drive	1000 GB
Access	USB and Ethernet
Software	Win 7 and MS Office
Monitor	23-inch with stand

The P-170 dimensions (see the pre-install guide for details).

	H x D x W	Weight
P-170 only	57 x 90 x 118 cm	195 kg
P-170 w/ isolation and signal tower	179 x 135 x 118 cm	660 kg

P-170 environment requirements:

	Environment
Relative Humidity	30 – 45% non-condensing
Temperature	16 – 25°C rate of change ≤ 2°C/hr
Floor Vibration	≤ 250 µ-inch/sec 1 to 100 Hz
Audio Noise	≤ 80 dB C-weighting scale
Laminar Airflow	≤ 100 ft/min down blowing

P-170 facilities requirements:

	Facilities	
Electrical	110 - 240 V	50 - 60 Hz
Electrical (Japan, non-CE)	100 - 240 V	50 - 60 Hz
Power	3 - 6 amps	single phase
Vacuum	650 mm Hg	27 liters/min
CDA[5]	70 – 90 psi	> 1.5 SCFM

5. CDA is required for the optional isolation table.

KLA-TENCOR SERVICE/SUPPORT

Customer service is an integral part of KLA-Tencor's portfolio that enables our customers to accelerate yield. Our vast customer service organization collaborates with worldwide customers to achieve the required productivity and performance at the lowest overall cost. K-T Services includes comprehensive contracts, time and materials, spares, asset management, customer training, and yield consulting.

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