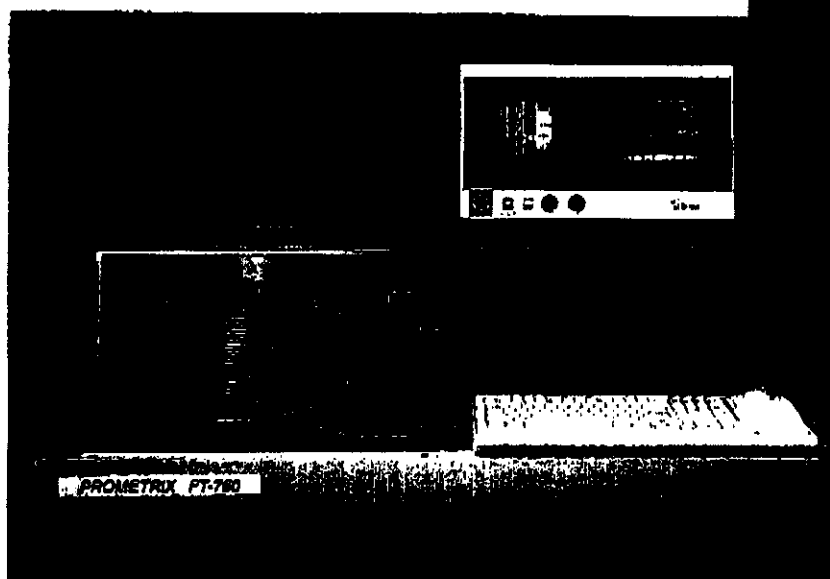


Prometrix FT-750

Film Thickness Measurement System



The Prometrix® FT-750 Film Thickness System is the production tool of choice for today's high-throughput wafer fab. The FT-750's automated film thickness measurements provide precise, easy-to-comprehend data for CVD, etch, lithography, diffusion, and other processes.

Dependable Microspot Capability

The Prometrix FT-750 system is a visible light spectrophotometer providing thin film measurements down to 150Å. The power of multiple wavelength spectrophotometry and optimized optical constants allow robust measurements of films such as polysilicon (doped and undoped), as well as pre- and post-etch utilizing a single program over a wide range of film variations in stoichiometry. The FT-750's advanced measurement

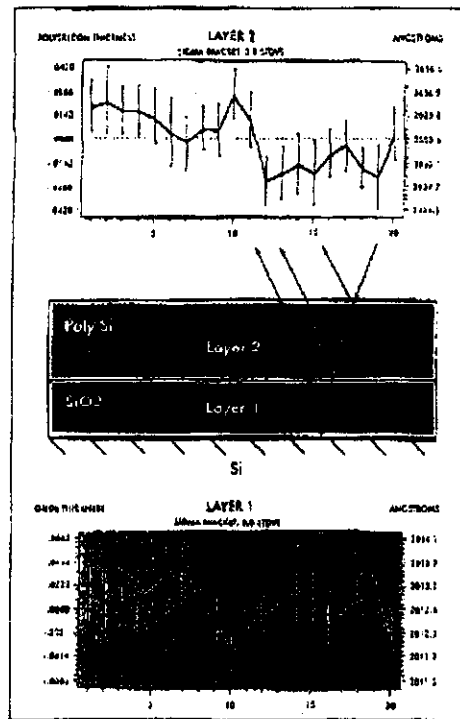
algorithms account for film dispersion, underlying film thickness, and differing numerical apertures.

Advanced Measurements

The FT-750 is adept at measuring single-layer films such as oxide, nitride and photoresist, as well as multi-layer stacks such as polysilicon or amorphous silicon on oxide. The reflectivity mapping capability, together with the optional gamma curve plotting, allows you to optimize your lithographic processes by automatically determining the contrast and sensitivity of virtually any photoresist.

The FT-750 presents test results quickly and dynamically, using color displays and a variety of sophisticated computer graphics such as color-keyed die maps that alert the operator to any out-of-specification condition.

The FT-750 is capable of simultaneously resolving up to three independent layer thicknesses using the new Simultaneous Multi-Layer (SML) algorithm.



The FT-750 also creates full-color, high-resolution contour and difference maps, 3-D plots, and trend and SQC charts.

Cost-Effective Pattern Recognition

As with all Tencor thin film products, the pattern recognition system with edge detection feature allows monitoring of wafers with low image contrast or variable contrast. This is useful for today's challenging etch and polishing applications. Pattern recognition models and measurement recipes can be moved from system to system and to a host computer with an advanced SECS II communications package — without the need to retrain the models to account for subtle variations in wafer patterns or machine parameters. The system's exceptionally high throughput addresses the needs of the most demanding automated wafer fab environment.



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Selected Specifications

Thickness Range

Oxides: <math>< 40\text{\AA}</math> to 40 $\mu\text{m}</math>
 Nitrides: <math>< 70\text{\AA}</math> to 40 $\mu\text{m}</math>
 Oxynitrides: <math>< 100\text{\AA}</math> to 40 $\mu\text{m}</math>
 Photoresists/Polyimides: 500 $\text{\AA}</math> to 40 $\mu\text{m}</math>
 Poly on Oxide¹: 200 $\text{\AA}</math> to 2.0 $\mu\text{m}</math>
 poly on 80 $\text{\AA}</math> to 4,000 $\text{\AA}</math> oxide
 Poly on Nitride²: 200 $\text{\AA}</math> to 2.0 $\mu\text{m}</math> poly on 80 $\text{\AA}</math> to 4,000 $\text{\AA}</math> nitride
 Amorphous Silicon³: 200 $\text{\AA}</math> to >1.0 $\mu\text{m}</math> amorphous Si on 80 $\text{\AA}</math> to 4,000 $\text{\AA}</math> oxide
 Oxide on Aluminum²: <math>< 1,000\text{\AA}</math> to 3 $\mu\text{m}</math>
 Oxide on Tungsten²: <math>< 1,000\text{\AA}</math> to 3 $\mu\text{m}</math>
 Transparent Multilayer²: Total thickness of all layers >500 $\text{\AA}</math>, top layer of up to a 3 layer stack$$$$$$$$$$$$$$$$$$$$

Reflectivity Range

410 nm to 800 nm, direct measurement

Performance Specifications

Absolute Accuracy²

Thickness: Within +/- 1% of NIST certified range for films 500 $\text{\AA}</math> to 1 $\mu\text{m}</math>$$

Precision⁴

Thickness: 1.5 $\text{\AA}</math>, 1 σ @ 70 $\text{\AA}</math> to 2,000 $\text{\AA}</math>
 0.07%, 1 σ @ 2,000 $\text{\AA}</math> to 5,000 $\text{\AA}</math>
 0.04%, 1 σ @ 5,000 $\text{\AA}</math> to 1 $\mu\text{m}</math>$$$$$$$

Refractive Index⁵:

0.00075, 1 σ for oxides

Physical Characteristics

Height: 60 inches (152 cm)
 Width: 48 inches (122 cm)
 Depth: 40 inches (102 cm)

For complete specifications, see the FT-750 specification sheet

¹ Assumes smooth specular surface.

² Surface roughness typically <math>< 20\%</math> of film thickness for thin films, thicker films greater.

³ Of NIST certified range using traceable wafer standards.

⁴ For oxides and nitrides, defined as the one sigma standard deviation of 30 site measurements at the center of a uniform wafer (focusing each time, without moving the wafer on the stage).

⁵ For most thicknesses of a single layer film on silicon, 5X objective

Prometric is a trademark of Tencor Instruments.

Specifications subject to change.

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Prometrix® FT-750 Film Thickness System

Specifications

Measurement Capabilities

Thickness Range

Oxides:	<40Å to 25 µm
Nitrides	<70Å to 25 µm
Oxynitrides:	<100Å to 25 µm
Photoresists/Polyimides:	500Å to 25 µm
Poly on Oxide ¹ :	200Å to 2.0 µm poly on 80Å to 4,000Å oxide
Poly on Nitride ¹ :	200Å to 2.0 µm poly on 80Å to 4,000Å nitride
Amorphous Silicon ¹ :	200Å to >1.0 µm amorphous Si on 80Å to 4,000Å oxide
Oxide on Aluminum ² :	<1,000Å to >3.0 µm
Oxide on Tungsten ² :	<1,000Å to >3.0 µm
Transparent Multilayer ³ :	Total thickness of all layers >500Å, top layer of up to a 3 layer stack

Additional Films/Measurements³

- Anti-reflective coatings
- Silicon on insulators
- Films on silicides
- Refractive Index

Reflectivity Range

410 nm to 800 nm, direct measurement

Performance Specifications

Absolute Accuracy⁴

Thickness: Within ± 1% of NIST certified
range for films 500Å to 1 µm

Precision⁵

Thickness: 1.5Å, 1σ @ 70Å to 2,000Å
0.07%, 1σ @ 2,000Å to 5,000Å
0.04%, 1σ @ 5,000Å to 1 µm

Refractive Index:⁶ 0.00075, 1σ for oxides

Stability⁷

Thickness: 3Å, 1σ of means @ 70Å to 3,000Å
0.1%, 1σ of means @ 3,000Å to 1 µm

Throughput⁸

- 65 monitor wafers per hour (200 mm),
pre-programmed focus
- 50 patterned wafers per hour (200 mm),
pre-programmed focus
- 30 patterned wafers per hour (200 mm),
autofocus

Measurement Time⁹

1.5 - 5 seconds typical per site

Test & Analysis Capabilities

Mapping

Die, contour, 3-D

Scanning

Diameter scan

Sampling

Quick tests: user definable

StatTrax[®] Software

- 729 pre-defined test configurations per account
- Average, difference, ratio maps
- Process control charts
- Statistical calculations
- Database management
- Correlation curves
- Pattern Recognition Transportability
- Multiple films (9) & sites (100) per die

Optional

- Gamma Curve
- Spectral data upload

Hardware Components

Measurement Unit

Spot Placement ¹⁰ :	± 8 µm
Standard Wafer Sizes:	100, 125, 150, and 200 mm
Illumination Source:	Tungsten/Halogen Lamp
Imaging System:	Color Camera and monitor
Objectives:	Automatic, 5-position turret: 2.5X, 5X, 10X, 20X, 50X
Spot Sizes:	80, 40, 20, 10, 4 µm
Maximum Field of View ¹¹ :	2.25mm x 3.0mm (nominal)
Filters:	Computer controlled neutral density, wave length cut-off and color filters
Focus:	Automatic focus
Controller Computer:	486-based computer 110 Mb internal hard drive
Data Storage:	44 Mb removable cartridge
Monitor:	High resolution color
Data Transfer Standard:	SECS II protocol, ASCII data upload, or ASCII to floppy
Optional:	Enhanced SECS II protocol with bi-directional host communication including support for robotic control
Diagnostics:	LCD panel and keyboard

Auto Wafer Handler

Cassettes:	Two positions: SEMI Standard H-Bar
Wafer Handling:	Backside vacuum pick-up; random access
Wafer Pre-Alignment:	Optical non-contact; centered and notch or flat aligned
Wafer Sorting:	User-definable measurement limits
Diagnostics:	LCD panel and keyboard, teachable alignments
Automation:	System compatible with automatic guided vehicles
Handler Safety Shield:	Optional

Physical Characteristics

Height:	60 inches (152 cm)
Width:	48 inches (122 cm)
Depth:	40 inches (102 cm)
Instrument Weight:	700 lbs. (318 kg)

Installation Requirements¹²

Vacuum (two lines):	500 mm Hg
Power:	110/220 V, 50/60 Hz, 15A
Ambient Temperature:	18°C - 25°C, Stability ± 2°C over 24 hour period
Relative Humidity:	30% - 45%

¹ Assumes smooth specular surface.

² Surface roughness typically <20% of film thickness for thin films, thicker films greater.

³ For films not listed, consult your local sales representative for details.

⁴ Of NIST certified range using traceable wafer standards.

⁵ For oxides and nitrides, defined as the one sigma standard deviation of 30 site measurements at the center of a uniform wafer (focusing each time, without moving the wafer on the stage).

⁶ For most thicknesses of a single layer film on silicon, 5X objective.

⁷ For oxides and nitrides, defined as one sigma of means of all 30 site tests at the center of a uniform wafer (focusing each time, without moving the wafer on the stage). Two times a day over a 5 day period.

⁸ 5 site measurement; standard Prometrix qualification test with 25 wafers run in a cassette. Throughput will vary depending on test setup and wafer size.

⁹ Depends on wafer and test configurations.

¹⁰ Site by site alignment on a 200 mm wafer. Placement within a 20 µm x 20 µm box.

¹¹ Using 2.5X objective.

¹² For additional information, refer to facilities requirements.