Tropel® FlatMaster® MSP-300 Wafer Analysis System

Fast and precise flatness and thickness variation measurements of 300 mm wafers

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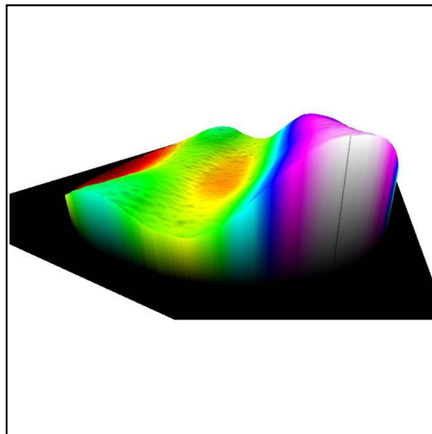
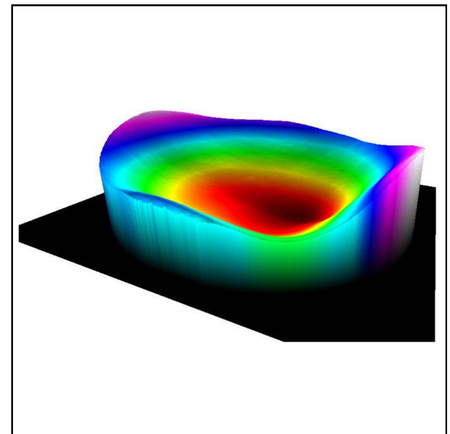
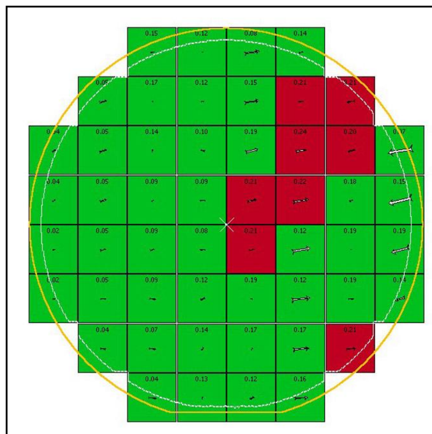
The ability to measure flatness, thickness, and thickness variation of 300 millimeter glass and silicon wafers is critical for successful integration of 3DIC assemblies. Traditional contact probes or conventional interferometry systems are too slow or do not have the necessary accuracy for larger fields of view.

The Tropel® FlatMaster® MSP-300 (Multi-Surface Profiler) is a frequency stepping interferometer that provides fast and accurate metrology for 300 mm glass and silicon wafers. In seconds over 3 million data points are collected with sub-micron accuracy enabling total thickness and flatness characterization over the entire surface.







Measurement Parameters

Wafer

- *GF3R (TIR)*
- *GF3D (FPD)*
- *GFLR (NTV)*
- *GFLD (NTD)*
- *GBIR (TTV)*
- *BOW, WARP, and SORI*

Site

- *SBIR (LTV)*
- *SBID (LDOF)*
- *SF3R (LTIR)*
- *SF3D (LFPD)*
- *SFLR (LTIR)*
- *SFQR (LTIR)*
- *SFQD (LFPD)*

Top: Tropel® FlatMaster® MSP-300 System; simultaneously measures the front surface and thickness variation on glass and other substrates. EFEM and Class 1 sub-enclosures available upon request.

Middle: Full surface 3D Total thickness Variation (GBIR/TTV) measurement of a 300 mm glass wafer with less than 2 µm total thickness variation.

Bottom: Stepper simulation plot analyzing site flatness (SFQR/LTIR). Other stepper simulation parameters are available and site layouts can be customized for any configuration.

Top: Samples of low thickness variation 300 mm glass wafers are available from Corning.

Middle: Full front surface 3D measurement of the 300 mm glass wafer enabling Bow/Warp, SORI, and other free state wafer parameters. The combination of front surface and TTV measurements provide complete characterization of the substrate.

Bottom: Listing of the Semi standard parameters (and familiar names) of wafer surface and thickness variation characteristics.

Tropel® FlatMaster® MSP-300 Wafer System Preliminary Specifications

Performance

Measurement method	Frequency Scanning Interferometry
Field of view	> 305 mm
Z-Resolution	10 nm
Lateral resolution	0.15 mm
Measurement range (Z-Axis)	300 mm
Measurement time	< 60 seconds typical
Measured data points	3.1 million per measurement
Data analysis	3-D, contour, slice: x, y circumferential and radial, histogram and wafer analysis plots
Materials	Metals, glass, polymers, ceramics, and many others
Surfaces	Wire sawn, ground, lapped, polished, etched, and super-finished
Maximum Slope	Slope given by 0.5 mm of pure Bow error over 300 mm wafer

Accuracy and Repeatability

	Accuracy	Repeatability
Bow/Warp	0.5 µm*	0.2 µm
Thickness	0 .25 µm **	0.1 µm
TTV	0.1 µm **	0.02 µm

** on less than 10 µm Bow*
*** requires knowledge of index of refraction*

Tropel Metrology Software (TMS™)

Standard Parameters	Flatness, depth/height, parallelism, line profile, surface profile, Bow, Warp, SORI, GBIR (TTV), GF3R (TIR), GF3D (FPD), GFLR (NTV), GFLD (NTD), SBIR (LTV), SBID (LDOF), SF3R (LTIR), SF3D (LFPD), SFLR (LTIR), SFLD (LFPD), SFQR (LTIR), SFQD (LFPD), and others.
User-defined Report Layouts	User-configurable including: OpenGL® 3-D, 2-D, line trace (X/Y, radial, circular), color contour, isometric, histogram, user-defined tolerances, pass/fail criteria
Data Management	Available in report layouts, also MS Access® database, MS Excel®, CSV and serial port, optional export to industry standard database formats

Environmental and Facility

Temperature	15 °C to 25°C (59 °F to 77 °F)
Rate of temperature change	≤ 1.0 °C per hour
Vibration Isolation	Passive isolation included
Humidity	5% to 95% relative humidity, non-condensing
Power	100-240 VAC, 50/60 Hz, 4 Amp
Air/Vacuum	None required
System Dimensions (W x D x H)	160 cm x 103 cm x 150 cm (63 in x 40 in x 59 in)
System Weight	390 kg (860 lb)

Standard System Configuration

Camera Array	4 Megapixel
Computer	Windows® based PC
Software	TMS™ Analysis software
Traceable artifact	Included

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For more information about the FlatMaster® MSP-300 Wafer system, or any other Tropel® Metrology Instrument, please contact:

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