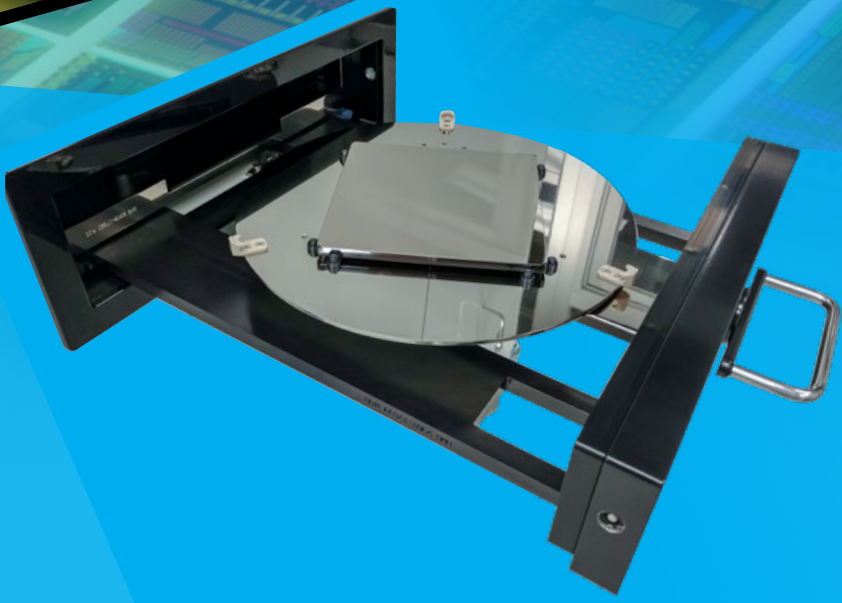
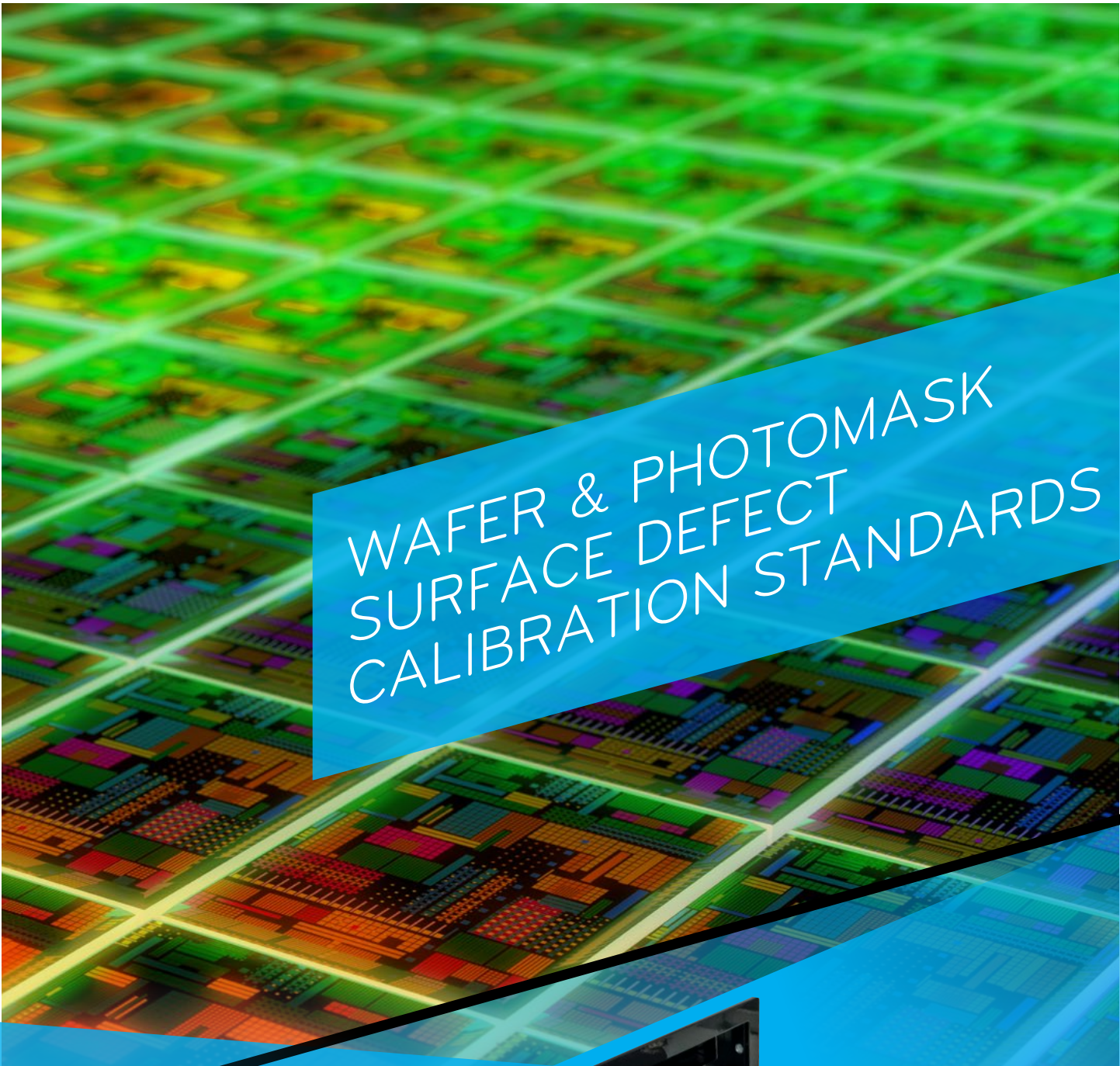


WAFER & PHOTOMASK  
SURFACE DEFECT  
CALIBRATION STANDARDS



# IMPROVING YOUR SURFACE DEFECT INSPECTION VISION

For IDMs, high-quality surface defect calibration standards reduce inconsistencies within your inspection tool fleet and help you monitor inspection system sensitivity and overall performance. Our standards enable inspection tools to better identify defects to increase yield in integrated device manufacturing.

For OEMs, custom wafer and photomask deposition services with quick turnaround means that your surface inspection system is developed more quickly with a higher degree of accuracy -bringing it to market faster and with more confidence.

MSP's Wafer and Photomask Calibration Standards meet today's measurement applications, including:

- + Incoming bare wafer inspection/qualification
- + Process tool qualification and monitoring
- + Blanket film monitoring
- + Incoming photomask inspection/qualification
- + Production photomask monitoring
- + Inspection tool development and qualification

## COMPREHENSIVE PARTICLE DEPOSITION SERVICES

MSP provides certified Wafer and Photomask Calibration Standards for calibrating, qualifying, and monitoring wafer and photomask inspection systems. Particles of specified size, composition, and count are deposited on a bare silicon wafer or your substrate of choice, including wafers, HDD disks, or photomasks (any type). Particles can be deposited on bare, film, and patterned wafers from 100mm to 450mm.

MSP is a leader in the industry, providing advanced technology to cover customers' particle/calibration needs, including:

- + Commercial particle deposition technology (having worked with top-tier companies for over 20 years)
- + Surface inspection system calibration standards
- + Particle suspensions (NanoSilica™ Size Standards, Process Particles™ Suspensions)



# CALIBRATION STANDARDS

MSP, A DIVISION OF TSI, PROVIDES SUPERIOR PARTICLE DEPOSITIONS FOR CALIBRATING AND QUALIFYING ADVANCED WAFER AND PHOTOMASK SURFACE INSPECTION SYSTEMS.

## Accuracy and Traceability

Differential Mobility Analyzer (DMA) technology precisely controls the mode (peak) of, and variation in, deposited particle diameter. DMAs are calibrated with SI traceability using the best available particle size reference materials, including PSL spheres from NIST. Calibrations are monitored on a weekly basis.

## Precision and Repeatability

Particle size (10nm to 20 $\mu$ m) and count (400 to >100,000 particles per deposit) are extremely repeatable from substrate to substrate. Spot diameter (typically 10-30mm) and spot location are consistent from deposit to deposit (adjustable with sub-millimeter precision).

## Faster Learning Cycles

MSP leads the industry in substrate processing speed. The faster the turnaround, the faster your learning cycle, and the faster your product can be developed.

## Certification and Quality Control

Deposited 200mm and 300mm wafers can be inspected with an in-house scanning surface inspection system (SSIS). For photomasks (reticles) and other substrates, MSP deposits particles on a witness wafer and inspects the deposits with the SSIS to qualify the process. Every substrate is handled with extreme care and packaged with our signature triple-wrap packaging, preventing contamination during transport.

## Customization

MSP will quote and provide a draft recipe for a standard according to your requirements for particle size and composition, deposit count, and deposit pattern type, size, and position on the substrate of your choice. Spot, Arc, Ring, and Full (Blanket) pattern types are available. Over 100 size standards are stocked (10nm to 20 $\mu$ m), and 14 particle materials are available.

MSP's signature triple-wrap packaging



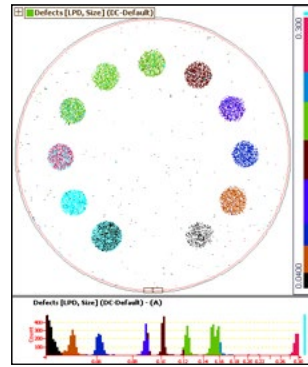
# SPECIFICATIONS

## WAFER & PHOTOMASK SURFACE DEFECT CALIBRATION STANDARDS

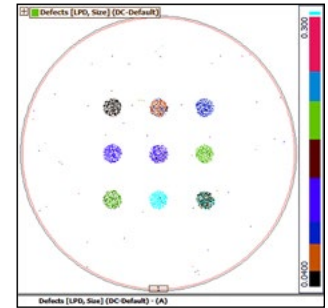
### Standard Substrates<sup>1</sup>

Substrate Type	Substrate Sizes Supplied by MSP (or Customer)	Substrate Sizes Supplied by Customer
Silicon Wafer	150mm, 200mm, 300mm	100mm, 450mm
Film Wafer	N/A	100mm, 150mm, 200mm, 300mm, 450mm
Glass Wafer	200mm, 300mm	100mm, 150mm, 450mm
Photomask	6" x 6" x 1/4" (Blank Only)	6" x 6" x 1/4" (All Types)
HDD Disk	N/A	65mm, 95mm

<sup>1</sup>Contact MSP for processing of custom substrates.



Spot deposits of PSL spheres ranging in size from 40 nm to 1112 nm



Spot deposits of MSP NanoSilica™ Size Standards ranging in size from 50 nm to 493 nm

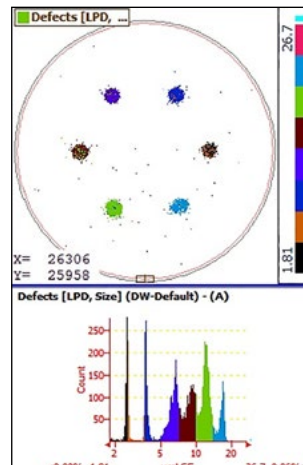
### Particle Deposit Attributes

Attribute	Available Options or Ranges
Pattern Type	Spot, Full, Arc, Ring
Particle Type / Material	+ PSL Size Standards + SiO <sub>2</sub> Size Standards + MSP Process Particles™ Suspensions <sup>2</sup> (Al <sub>2</sub> O <sub>3</sub> , AlF <sub>3</sub> , Ni, Si, SiO <sub>2</sub> , Si <sub>3</sub> N <sub>4</sub> , Ta, Ti, TiO <sub>2</sub> , TiN, W, Y <sub>2</sub> O <sub>3</sub> )
Particle Size <sup>3</sup>	10 nm - 20 μm
Particle Count	Minimum 400 particles per deposit
Pattern Width	Typically 10-30 mm. Range of Pattern Width (e.g., Spot Diameter) is dependent on Particle Size.

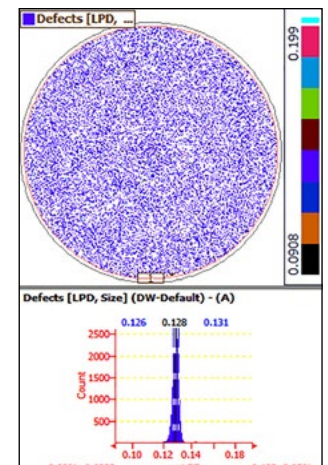
<sup>2</sup>Restrictions on particle size apply to all Process Particles™ Suspensions.

<sup>3</sup>Only PSL Spheres are available up to 20 μm.

SiO<sub>2</sub> Spheres are available up to 10 μm.



Spot deposits of PSL spheres (2-20 μm)



Full deposit of PSL spheres (modal diameter: 128 nm)

The MSP logo is a registered trademark of MSP Corporation, a division of TSI. TSI and the TSI logo are registered trademarks of TSI Incorporated.



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