

Non-Destructive TSV Inspection System SP8000S



SPIROX *LTS*®

Spirox *L*aser *T*omography *S*can

Non-Destructive: Effective Alternative to SEM Imaging
Industry First: Quantitative Inspection in TSV Process

- Exclusive optical scanning technology with patented non-destructive defect inspection enables real-time analysis without making physical cross sections.
- AI-assisted precision inspection of TSV side walls ensures accurate defect detection, supporting both blind and through vias.
- TSV quality assessment across the entire functional die on the wafer enables precise quantified evaluation for the die qualification and classification.

Features

- **TSV Inner Wall Defect Inspection:** Defects such as striations, scallops, and cracks can compromise the insulation layer and lead to leakage currents.
- **Defect Data Collection and AI Database Development:** Systematic collection and organization of large defect datasets, combined with AI technology to build an intellectual database, enables accurate analysis through quantitative defect inspection standards, optimizing process parameters to enhance product yield and manufacturing efficiency.

Advantages

- **Non-Destructive Inspection:** Non-linear optical inspection and patented SpiroXLTS technology enables precise, quantitative defect evaluation without sample destruction.
- **Quick Sample Inspection:** SP8000S offers a faster and more efficient inspection process compared to traditional cross-sectional scanning electron microscopy (SEM).
- **Precise Defect Positioning:** Precise localization of TSV defects across wafer dies, identifying critical regions and providing essential data for process optimization.

Benefits

- **Improving Efficiency and Yield:** Online automated inspection with big data collection reduces SEM sampling, accelerates process optimization, and significantly improves product quality and yield.
- **Reducing Production Costs:** Reducing defect rates and rework times, thus lowering material waste and production costs.
- **Enhancing Process Optimization:** Using AI analysis to continuously optimize processes, improving stability and performance.
- **Increasing Market Competitiveness:** Enhancing product reliability and consistency, attracting more customers and collaboration opportunities.
- **Data-Driven Decision Making:** Providing precise data analysis to optimize process parameters, enabling quick response to market changes and customer demands.

• Multi-Mode Automatic Inspection with Flexibility

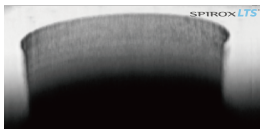
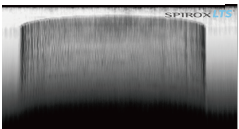
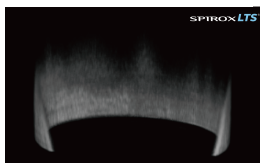
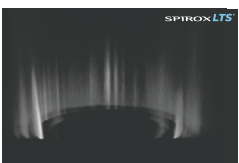
- ROI (Region of Interest) inspection modes
- Script scanning workflow
- Coordinate-based inspection mode
- Random inspection mode

• AI-Assisted Detection for TSV Defect Identification

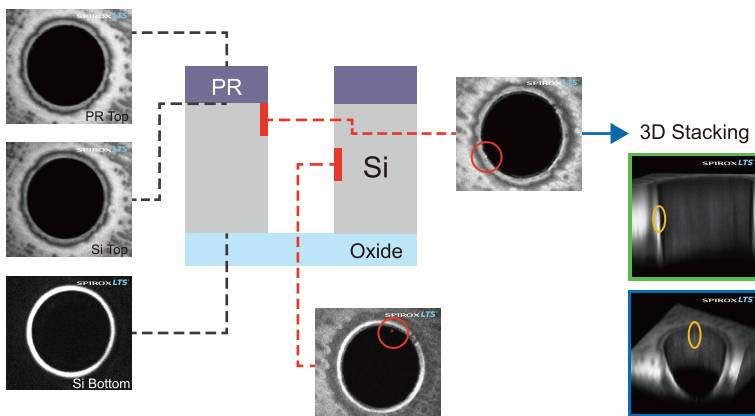
• Intuitive User Interface

• Automated Loading and Unloading

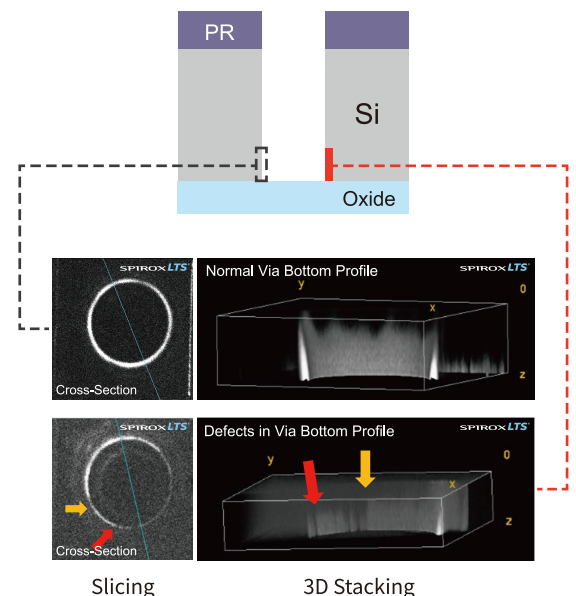
3D Imaging Comparison of TSV Quality

Hole Diameter	50 μm	50 μm
Via Top		
Via Bottom		

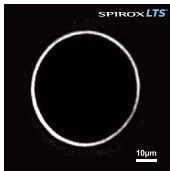
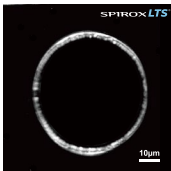
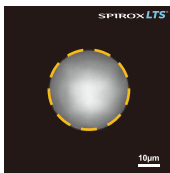
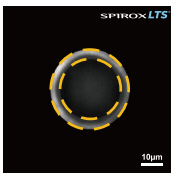
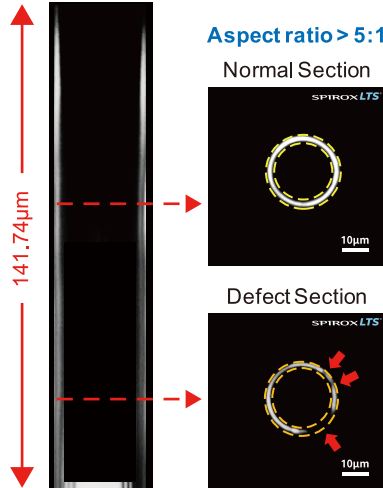
Capturing TSV Striation Cross-Section and 3D Imaging



Bottom TSV Striation Cross-Section & 3D Imaging

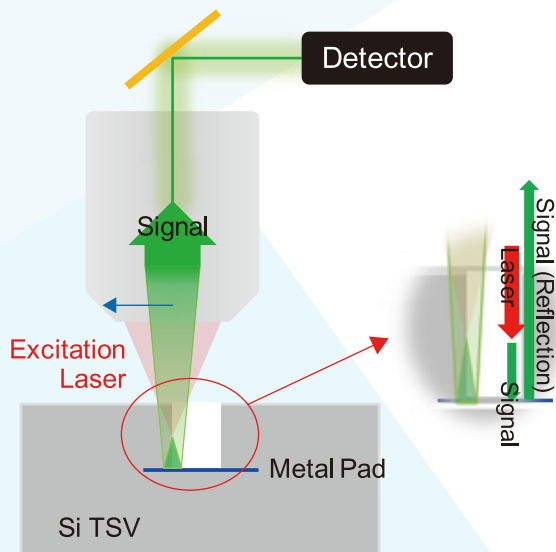


Specification

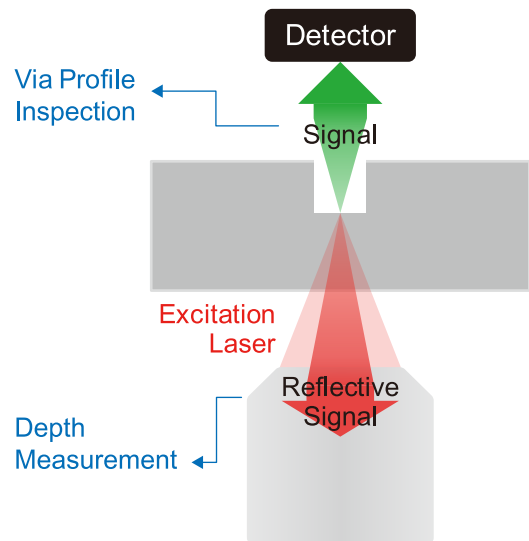
Model Number	SP8000S	Applicable Sample Size	12"/ 8" Wafers
Model Name	Non-Destructive TSV Inspection System	Load / Unload	Automated Loading and Unloading
Key Optical Technology	SpiroXLTS Nonlinear Optical Inspection	Objective Magnification	20x / 40x
Application & Inspection Items	Non-Destructive TSV In-Line Inspection System (IPQC) Designed for non-destructive quality inspection of TSV structures on function wafers. It is applied for sampling inspection during the mass production stage to monitor process stability in real time, improving overall yield and efficiency. The system features real-time inspection of via wall defects and detection of TSV bottom oxide residue.		Stability Verification for TSV Etching Equipment Designed to verify the stability of TSV etching equipment, enabling non-destructive measurement of TSV depth and real-time inspection of via wall defects.
	<ul style="list-style-type: none"> Fast Measurement of TSV Full-Wafer Depth Uniformity (AWU) (+ Opt. 001 or 002) FOV Multi-via Depth Measurement: Unaffected by surrounding metal layers and routing; utilizes pattern-based zone sampling; independent of sidewall profile and bottom flatness. Inline TSV Inner Wall Defect Inspection Detect abnormalities along the via wall, such as sidewall erosion, recesses, cracks, spikes, or striations, enabling early identification of defect trends to prevent downstream process issues. TSV Bottom Residue Inspection (Function Wafer) Designed for the metallization stage, this function detects oxide or other residues at the via bottom, helping ensure plating uniformity, bonding quality, and preventing open circuits or high resistance. 		<ul style="list-style-type: none"> Non-Destructive TSV Depth Measurement (+ Opt. 001 or 002) Accurately measures TSV depth on non-metalized structures through high-speed scanning to evaluate etching rates. Real-Time TSV Inner Wall Inspection (+ Opt. 001 or 002) Detect via wall defects such as sidewall erosion, recesses, cracks, spikes, or striations.
FOV/Masurement Time	<ul style="list-style-type: none"> Point Scanning: FOV 400 μm x 400 μm ; 3.5 seconds / frame ; 100 frames \approx 6 minutes Fast TSV Depth AWU Inspection: FOV 200 μm x 200 μm: 9 seconds (covers multiple vias) 		
Measurement Mode	Micro-area imaging, zone-based automatic measurement, and coordinate-based measurement; user-defined scanning sequences are also available.		
Measurement Resolution	Image Minimum Resolution 0.5 μm	Motion Resolution	X-Y axis Motion Resolution 0.1 μm Z axis Motion Resolution 0.1 μm
Air Supply	<ul style="list-style-type: none"> CDA (FAC→Sysmtem) ; 0.6-0.7 Mpa ; Pipe Diameter Φ 6 mm CDA (FAC→Sysmtem) ; 0.6-0.7 Mpa ; Pipe Diameter Φ 8 mm 		
Electrical Specification	220V 60Hz AC 4400W (Tentative)		
Dimensions/Weight	Length 2.869 m x Width 1.830 m x Height 1.900 m Weight 2700 kg (Tentative)		
Options	<ul style="list-style-type: none"> Opt. 001: Transmissive Single Optical Path Opt. 002: Transmissive Dual Optical Path Opt. NLR: Remove Automatic Loader/Unloader 		
Inspection Image	<p>TSV Sidewall Inspection</p> <div>   </div> <p>TSV Bottom Oxide Residue Detection</p> <div>   </div>		<p>TSV Cross Section</p>  <p>Aspect ratio > 5:1</p> <p>Normal Section</p> <p>Defect Section</p>

Optical Path Architecture

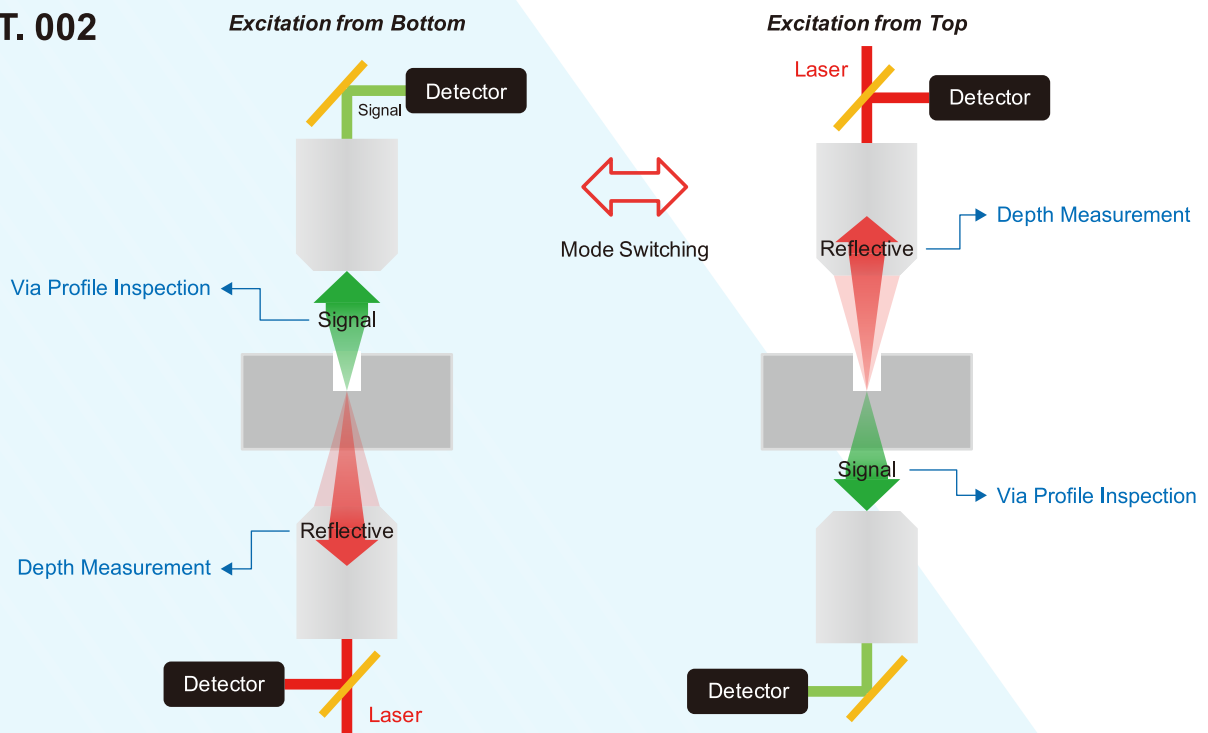
SP8000S



OPT. 001



OPT. 002



Contact us

 No. 95, Shuiyuan St., Hsinchu City 300042
 +886 3 573 8099 #1078
 daisy_wu@spirox.com

