

WaferSense™

by



**Precision Wireless Metrology Applications for
Improved Productivity and Process Control**

CyberOptics Semiconductor, Inc.

"innovating measurement technology"

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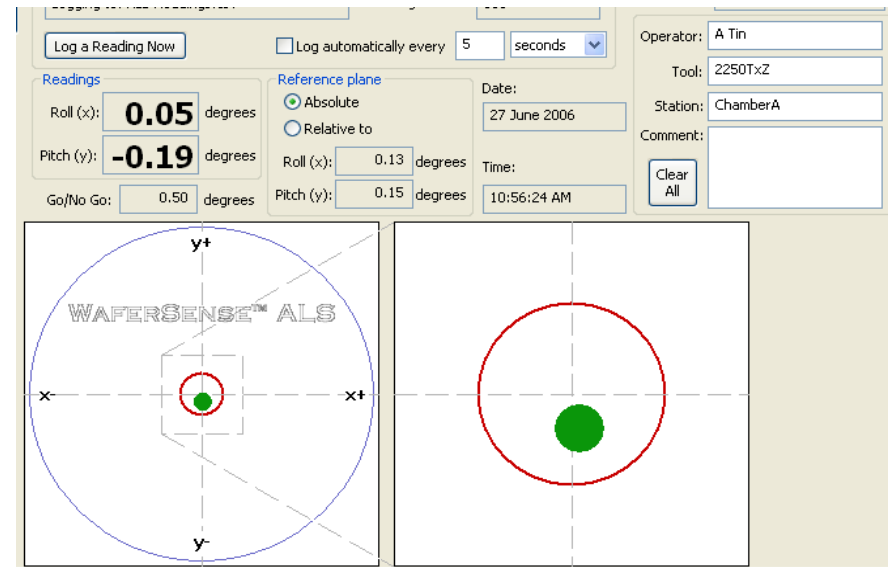
WaferSense™ Product Overview

- Wireless, Waferlike, battery powered form-factor with bluetooth communication
- Real-Time data reporting
- Real-Time Adjustments with Direct Feedback
- Ability to Record, Store and Trend Data over Time
 - Compare Tools, Chambers and Technicians
 - Correlate Process Results Tool to Tool
- Vacuum Compatible
- Inclination measurement, robot alignment, chamber gap measurement and vibration measurement systems



WaferSense™ ALS2- Inclination Measurement System

- Horizontal capability $\pm 7.0^\circ$ ($\pm 0.03^\circ$ accuracy)
- Vertical capability $\pm 50^\circ$ ($\pm 0.05^\circ$ accuracy)
- Wafer-like form factor and wireless communication ensure access to all stations
- Measurement data is logged for reference to CSV file
- Absolute and relative plane measurement



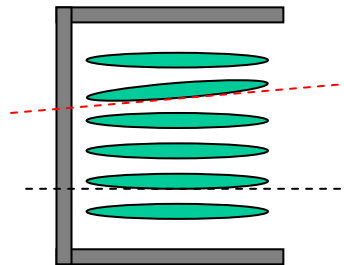
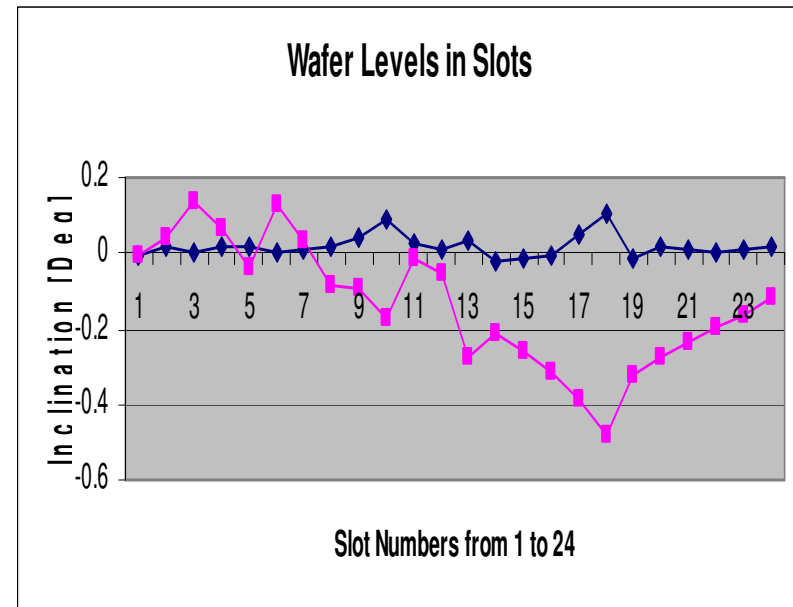
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ALS2 Value Propositions-

Foup and Cassette Validation

- X axis is shown as BLUE line and Y axis is shown as PINK line. Y axis is inclined 0.5 degrees to rear at 18th slot.

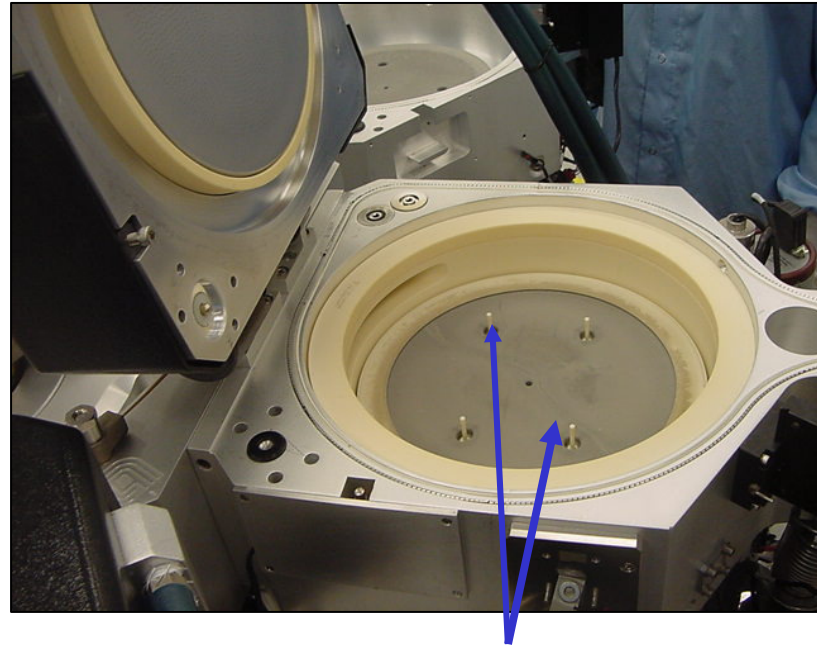
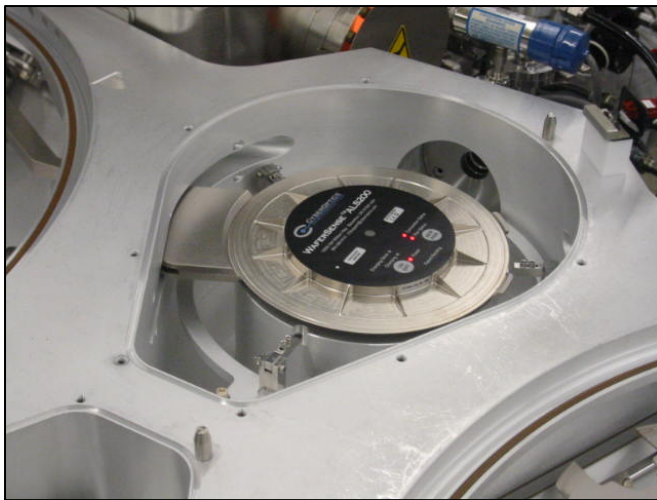


**18th Slot is inclined
for 0.5 degrees
from 3rd slot.**

In Tool Inclination Checks

Detects the slightest excursion in pitch and roll

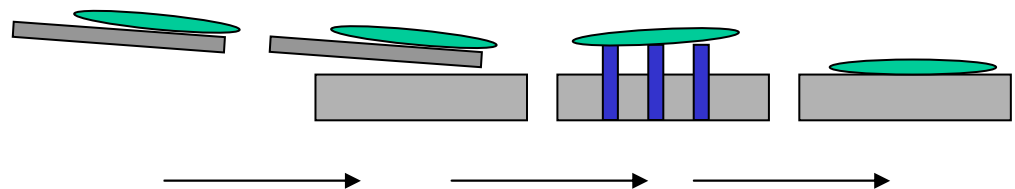
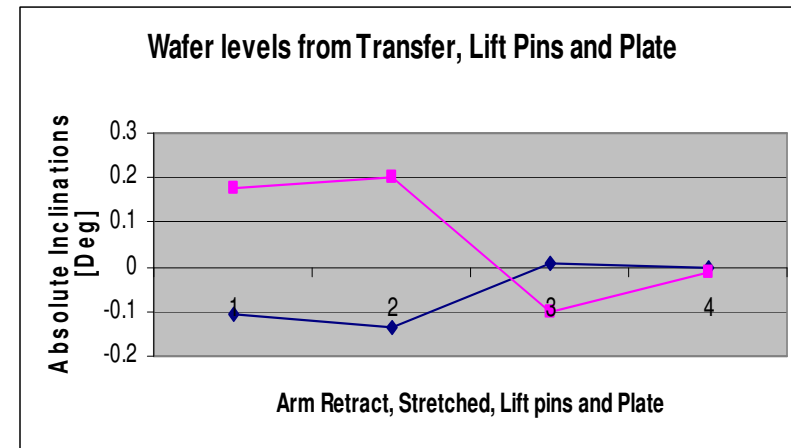
- **Accurate to $\pm 0.03^\circ$**



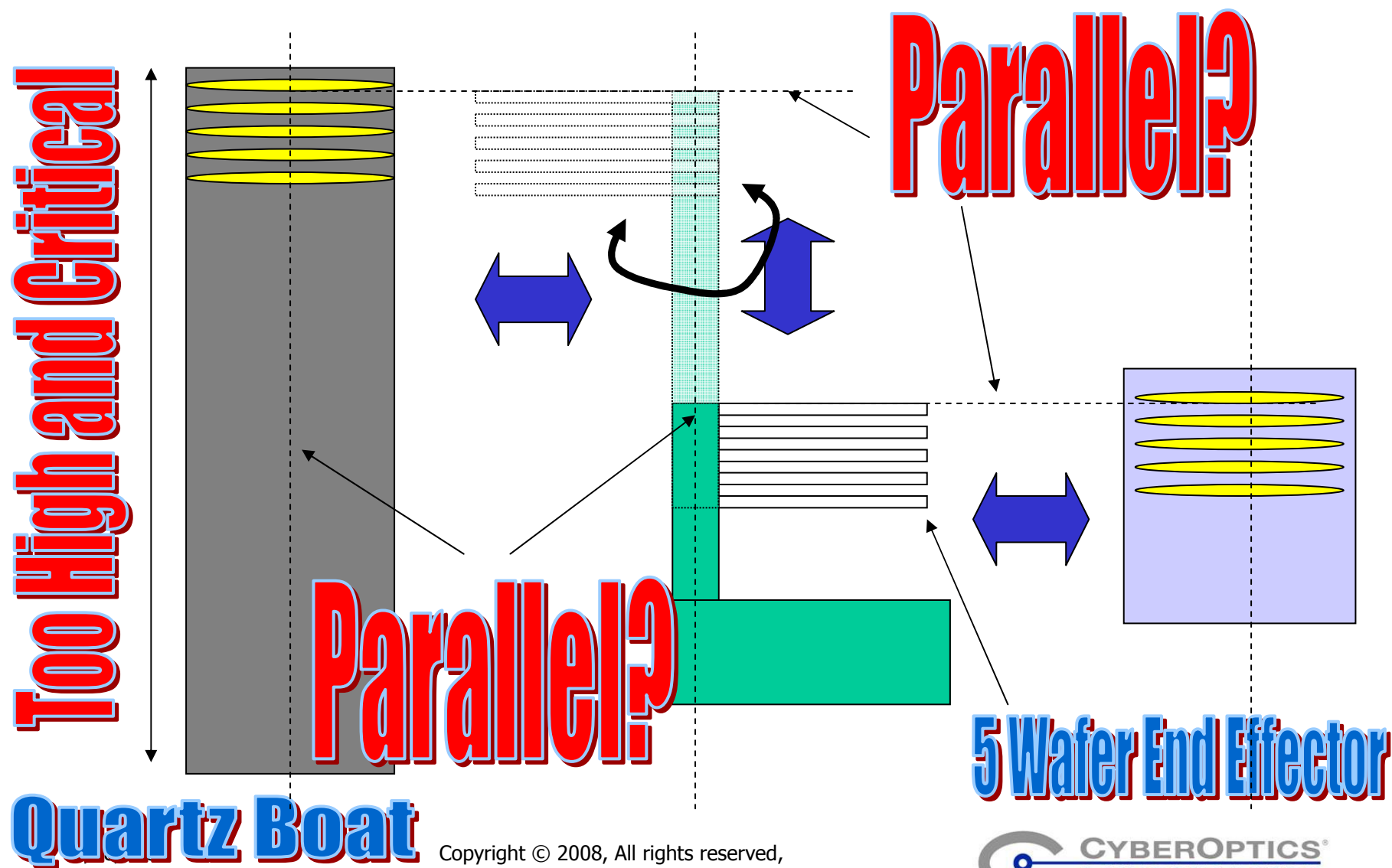
Easily levels end effectors, lift pins and hot plates to assure smooth wafer transfers and consistent process results

End Effector and Lift Pin Leveling

- ALS was transferred from End Effector Retracted, Stretched, Xfr to Lift Pins and Cool Plate
- Arm/end effector was pitched and rolled 0.1 and 0.2 degrees. Lift pin set is 0.1 degree pitched. Cool Plate is level



Vertical Furnace Leveling



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WaferSense™ ATS- Robot Teaching/Alignment/Positioning System



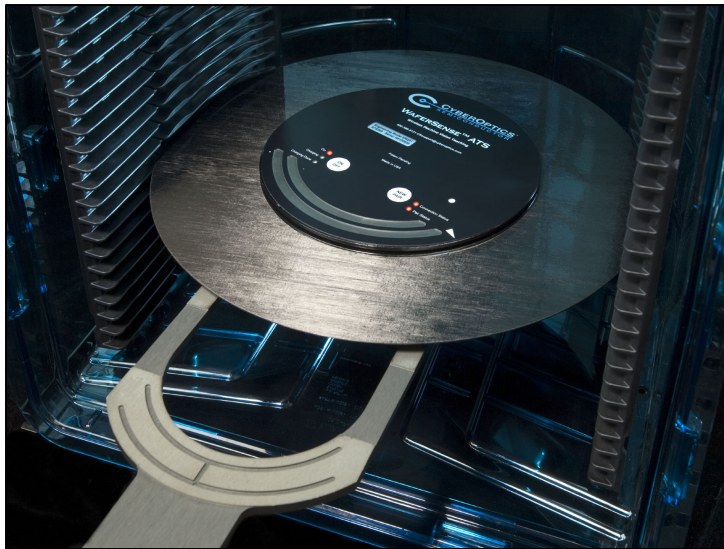
- Vision based target acquisition system
- On Board Camera w/Illumination & DSP
- Align automation handoffs
- Data can be logged to CSV file

- Center wafer placement- spin cups, hot/chill plates, diffusion boats, Deposition and Etch Chambers



Automatic Teaching System (ATS)

Wafer-like, wireless hardware



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Intuitive software

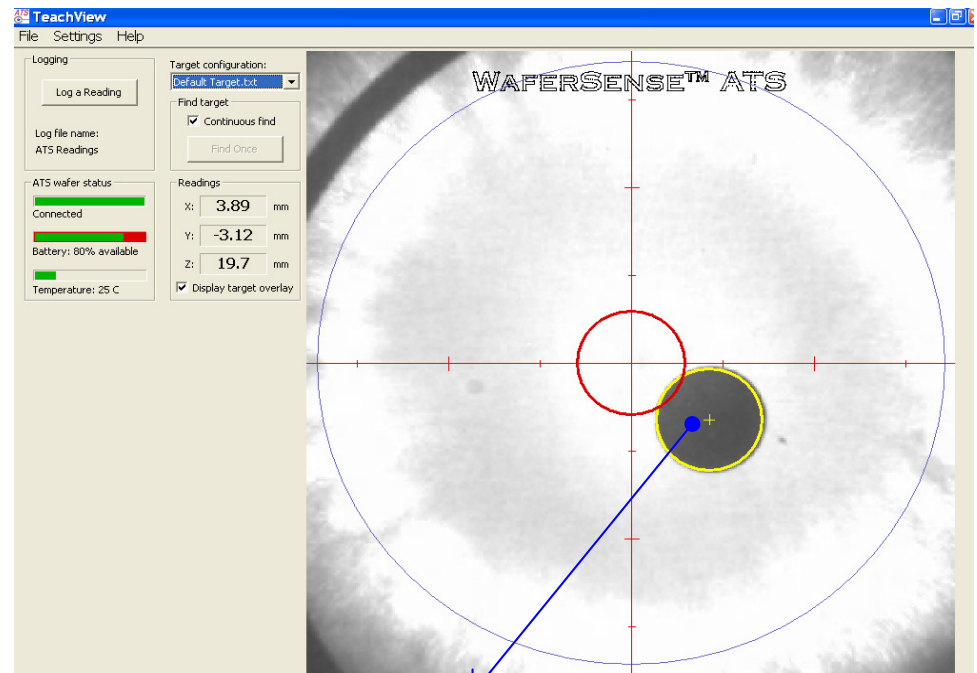
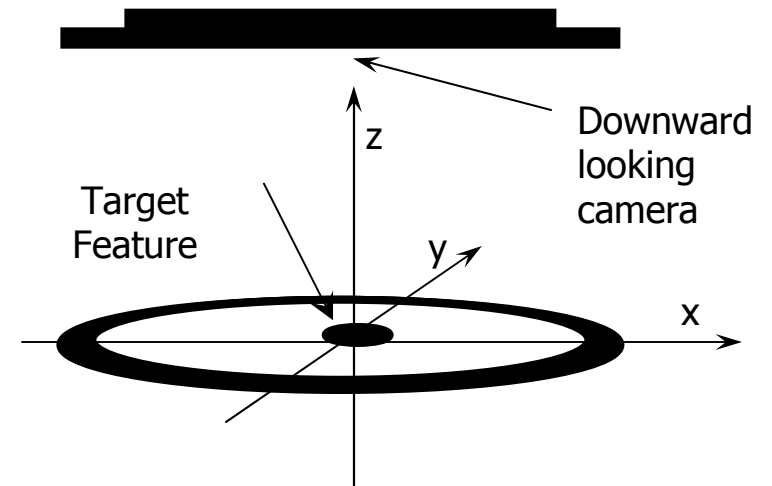
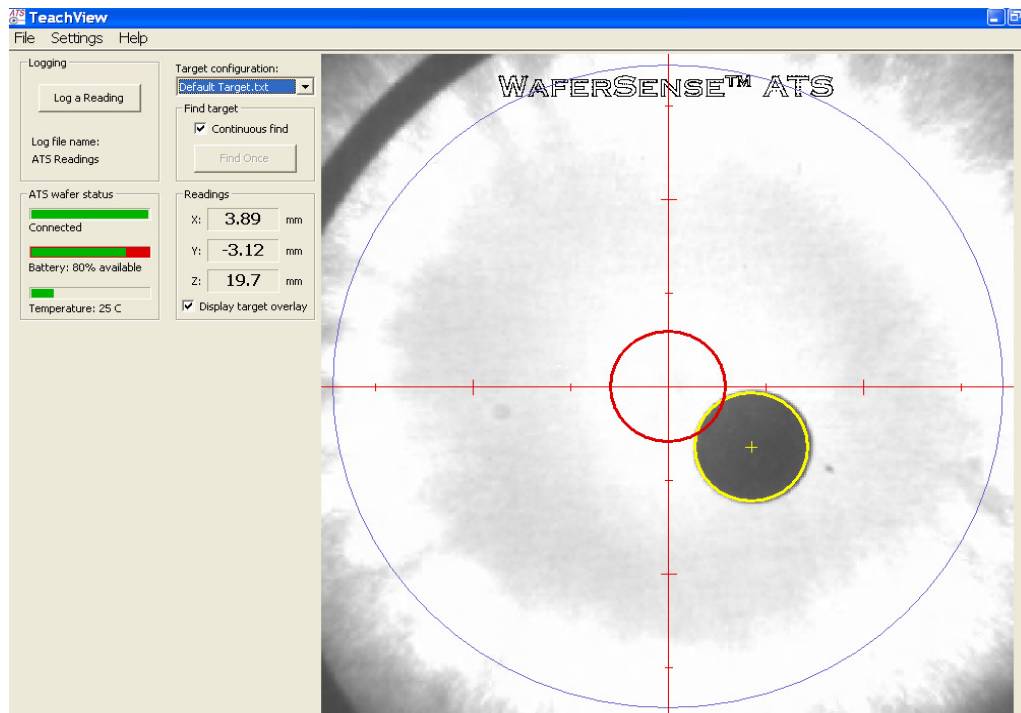


Image of Target
Feature acquired by
ATS camera

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ATS Innovative Principle of Operation

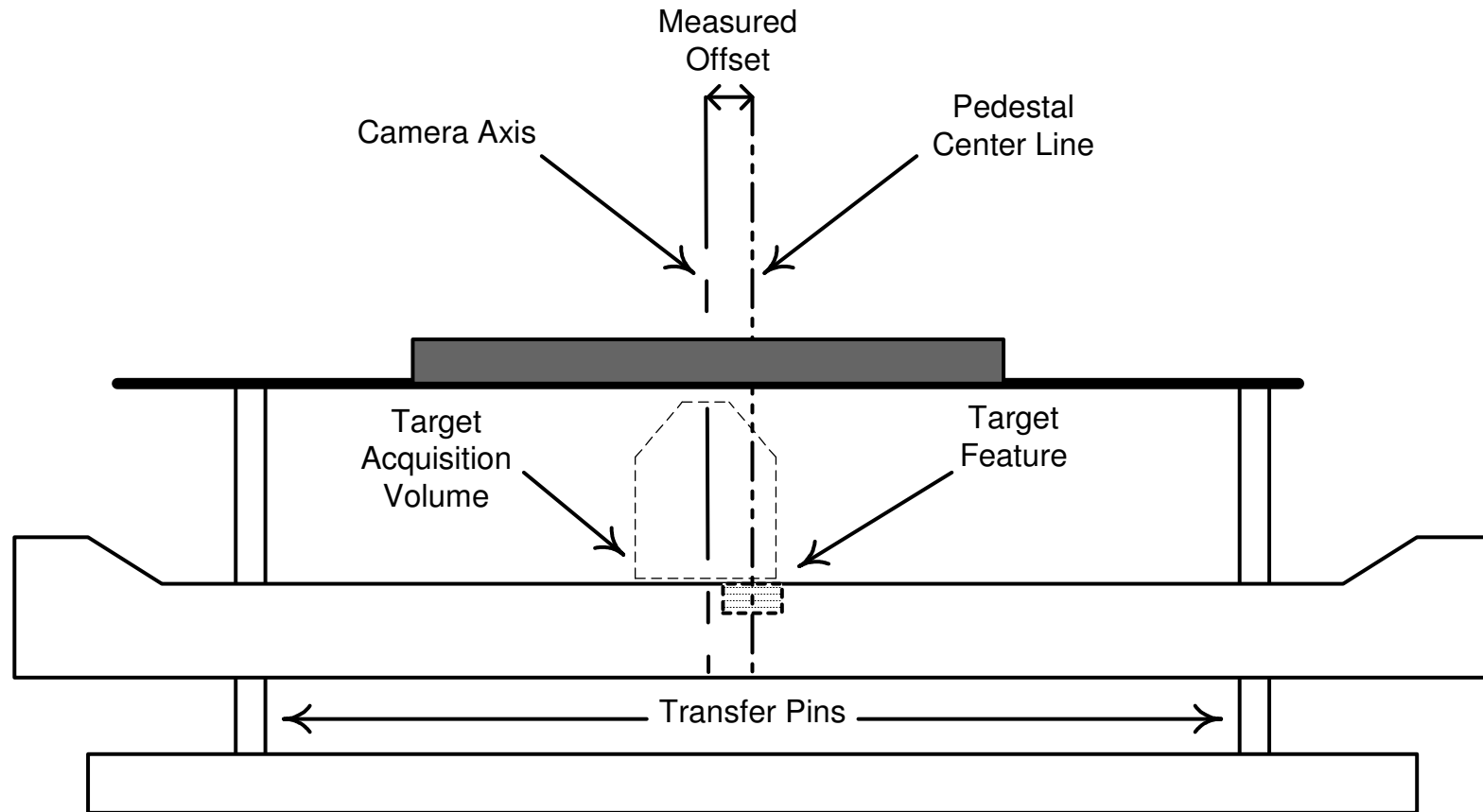


- Real-Time Video

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ATS Theory of Operation



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ATS Value Propositions

- *ATS does not require equipment dismantling or chamber breaking.*
- *ATS can access stations through automation and can be used by one technician.*
- *ATS collects/records objective data for consistent process setup and makes it available for statistical analysis and recording.*

WaferSense™ AVS: Wireless Vibration Measurements



- Wireless, non-contact, wafer-like device for measuring vibrations of wafer transfers in x, y and z axis
- Troubleshoot tool and robot issues
- Repeatable and Objective vibration and acceleration data can be Compared tool to tool
- Automatic handling, speeds setups & troubleshooting

WaferSense™ AVS- Overview

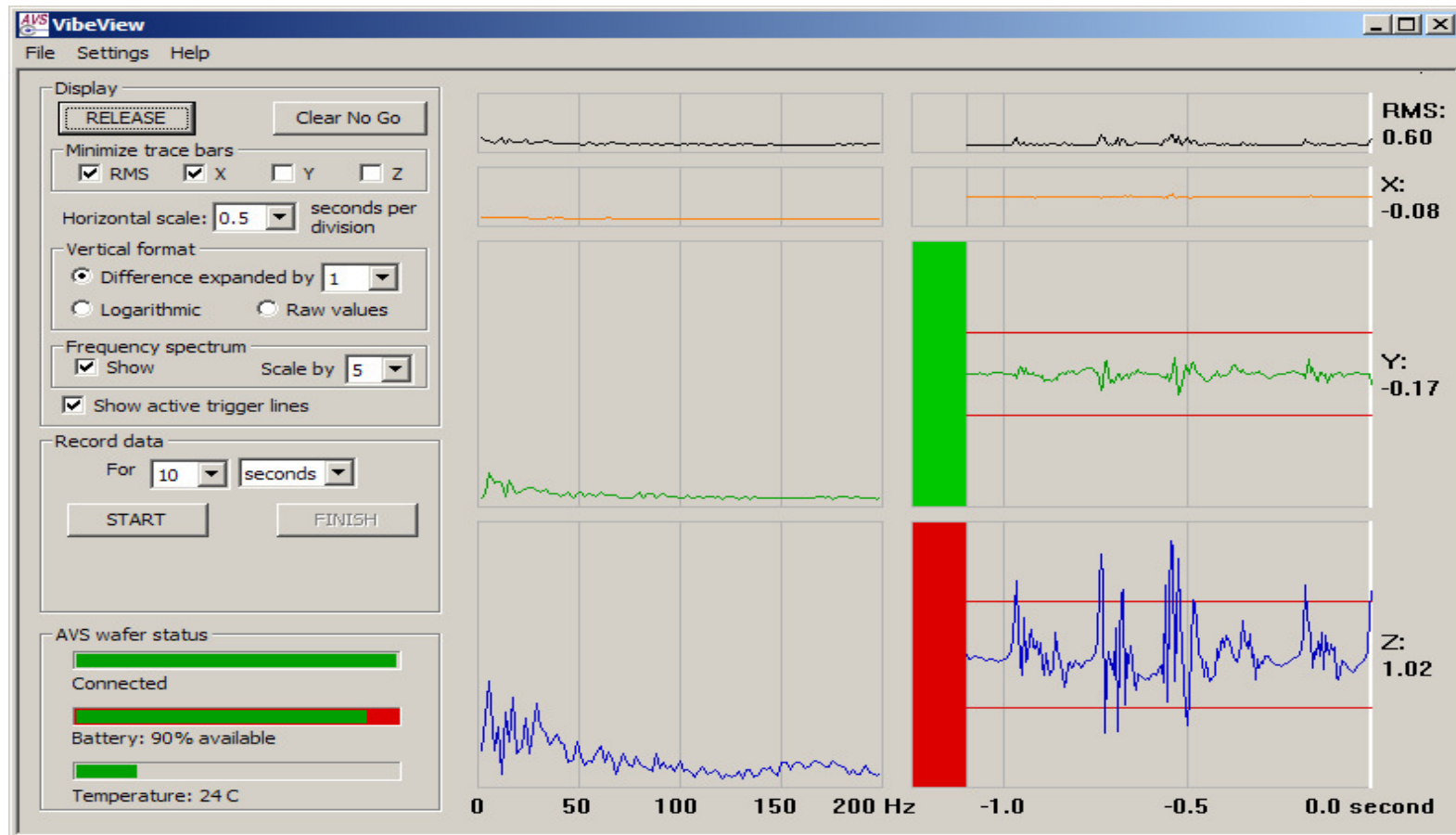
- Baseline performance can be recorded and periodically monitored for changes.
- Engineers can see the effect of adjustments in real time, speeding equipment alignment and setup, and motion parameters can be optimized.
- Vibration data can be compared not only to past readings but from one tool to another to reduce maintenance and cycle time.

AVS: Wireless Vibration System - Specs

- 3 axis measurement
- Dual SW applications for real time recording of events and replay/comparison of events
- Standard wafer sizes of 200 and 300 mm
- Freq Response: up to 200 Hz
- 1kHz Sample Rate
- Range ± 2 G
- Amplitude Resolution: ± 0.01 G
- Height 6.3 mm
- Weight: 300mm <200g, 200mm <150g, 450mm ~450g
- Operational use of more than 4 hours on a single charge
- Temperature spec: 20 - 70C continuous; Able to withstand temperatures of 120C for up to 5 minutes in air, not in contact with heat source

VibeView™ Event recording SW

- Real time display of time domain and frequency domain (FFT) data and recording capable software with selectable scale factor, Go/No Go, event marking, recording length.

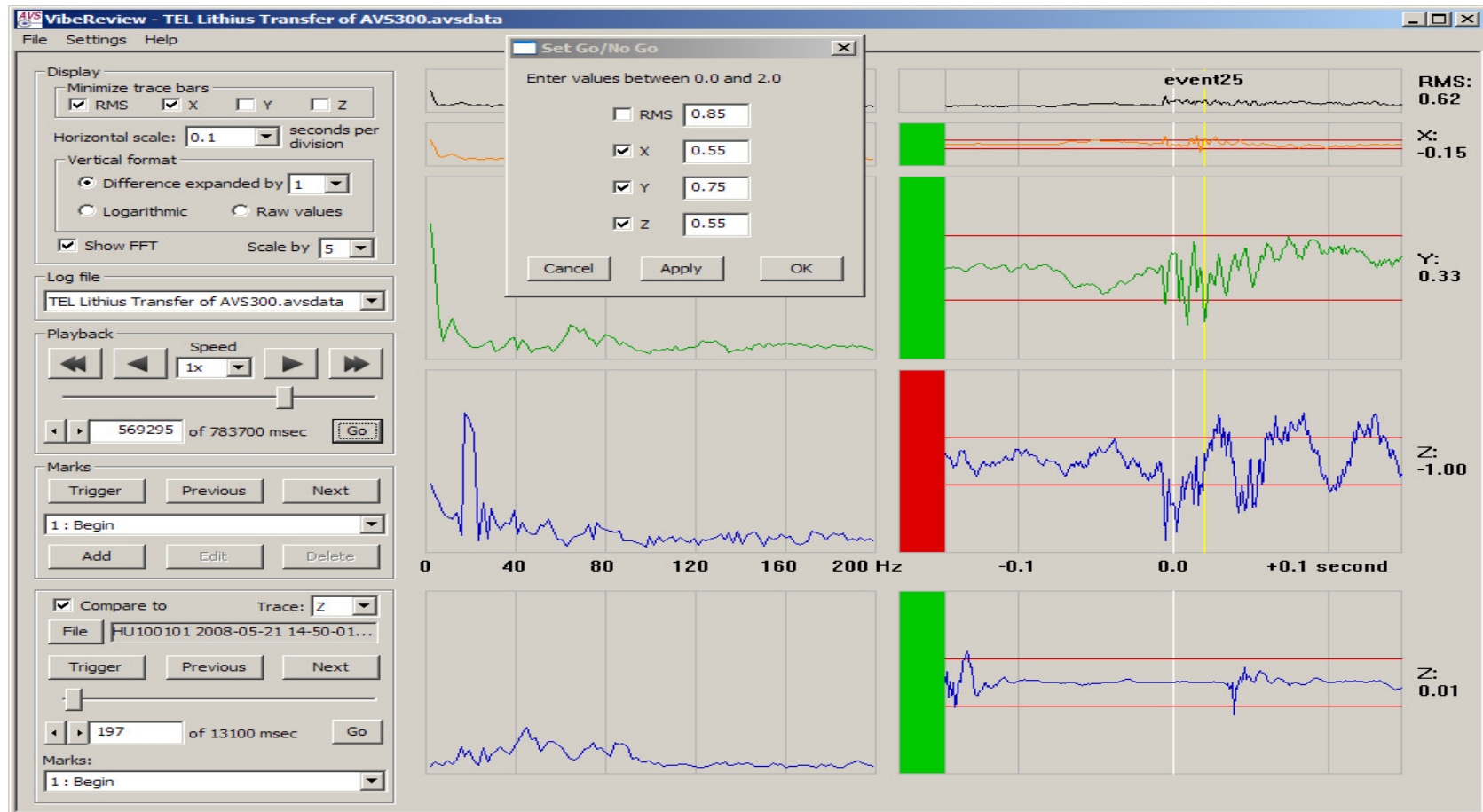


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VibeReview™ Event replay and comparison SW

- VibeReview™ allows you to display recorded event data and can compare multiple files.



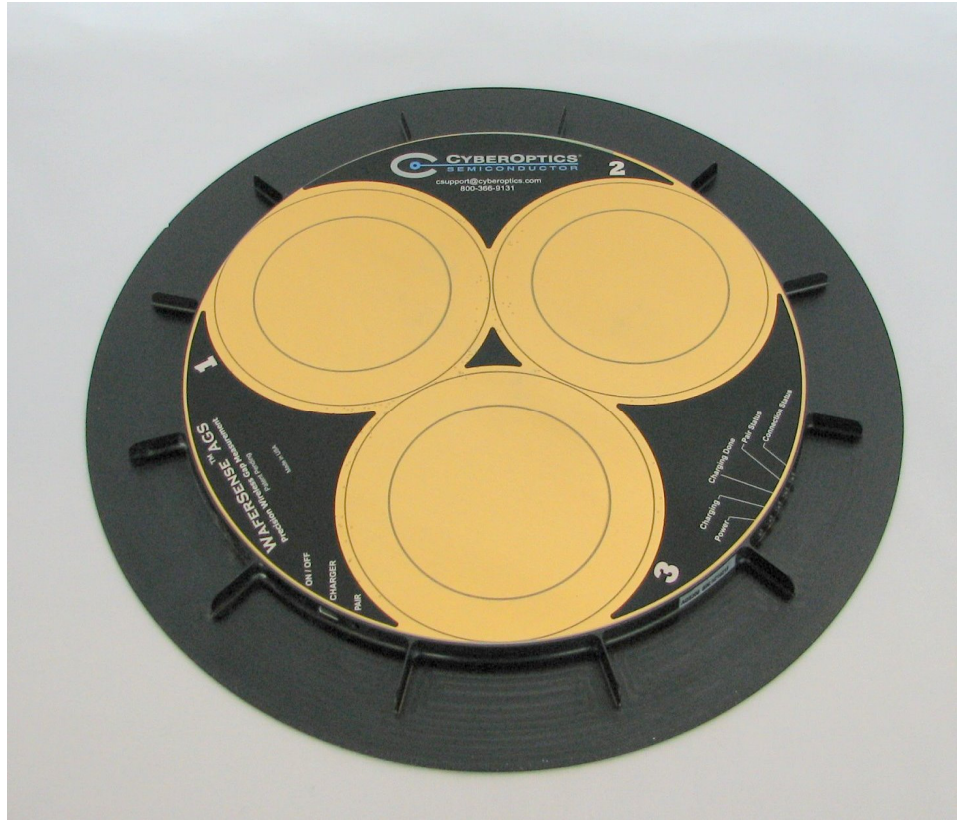
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AVS Value Propositions

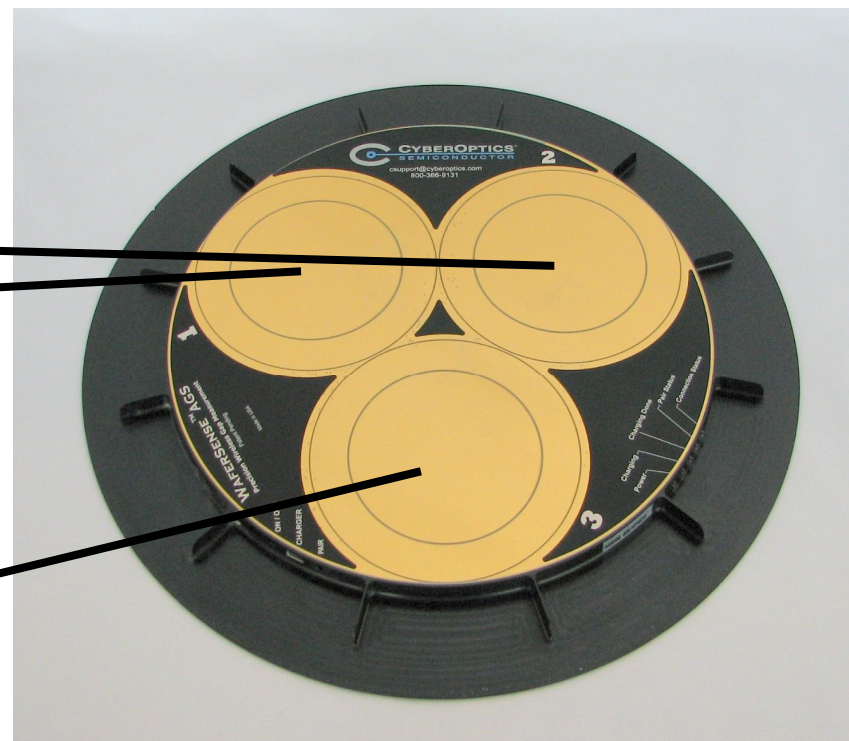
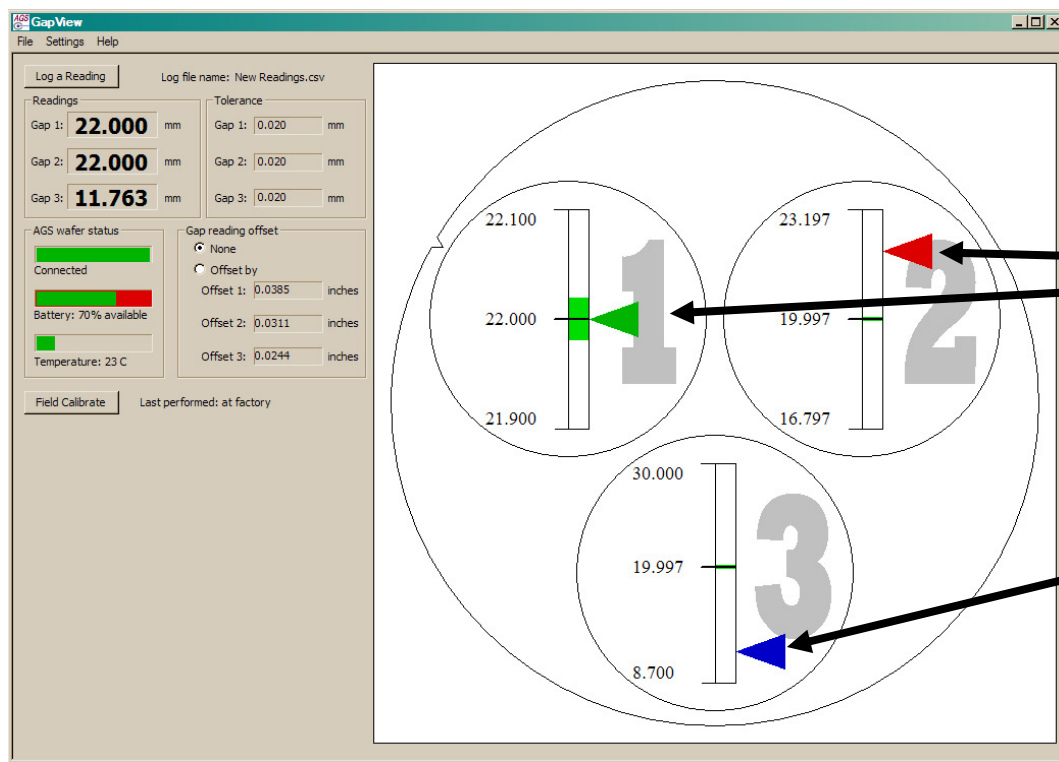
- *Troubleshoot and predict robot and transfer equipment failures before they happen*
- *Identify Wafer Scraping or Dragging that Impact Yields due to Particle Generation*
- *Verify acceptable conditions that exist on tools*

WaferSense™ AGS- Precision Wireless Gap Measurement



- Wireless, non-contact, wafer-like device for measuring critical gaps in Deposition & Etch tools
- Reduce tool calibration time with live feedback
- Objective & reproducible adjustments for better process uniformity
- Automatic handling, speeds setups, maintenance & troubleshooting

AGS Operation- Three capacitance sensors for measurement and parallelism

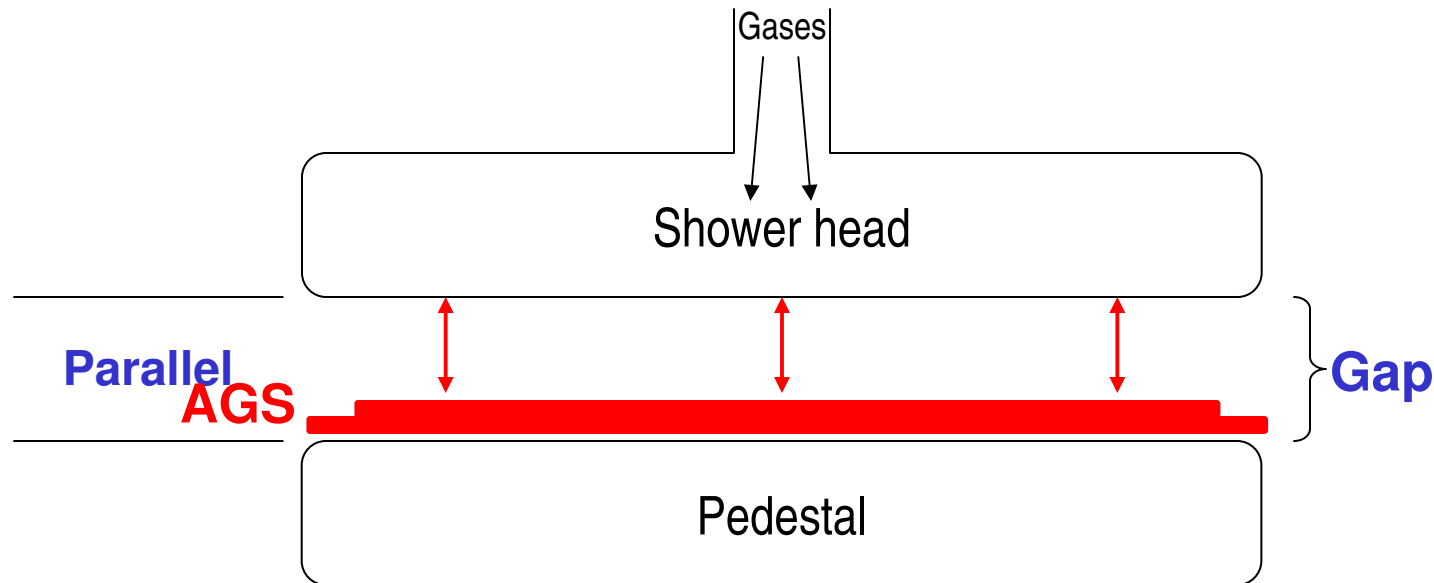


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How Does AGS Work?

- Three points define a plane
- Three equal gaps means surfaces are parallel

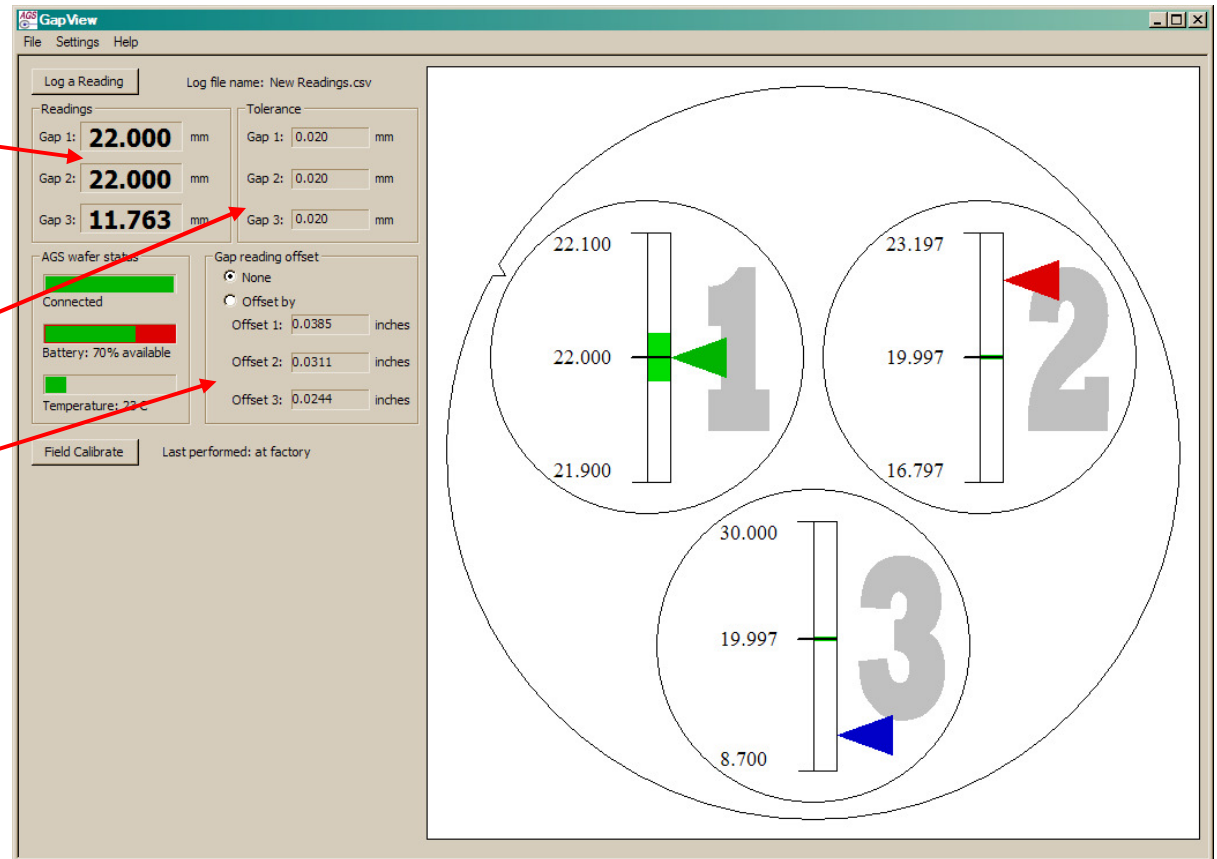


GapView™ SW Features

Current gap measurements

Your gap tolerance

Offset display



AGS Value Propositions

- *Reliable and accurate*
- *Recordable*
- *Non-contact, hands free capability*
- *Time savings*
- *Potential for better process uniformity*