

# WaferSense™ AVS Theory of Operation

WaferSense AVS can be used to measure vibrations experienced by wafers during processing. These vibrations are detected by measuring the instantaneous acceleration of the wafer in three orthogonal directions. The accelerations can be measured either as absolute or as the difference with respect to the time-averaged preceding acceleration measurements.

A typical application for WaferSense AVS would measure the vibration experienced at a process stage and during operations that transport the wafer through a processing tool.

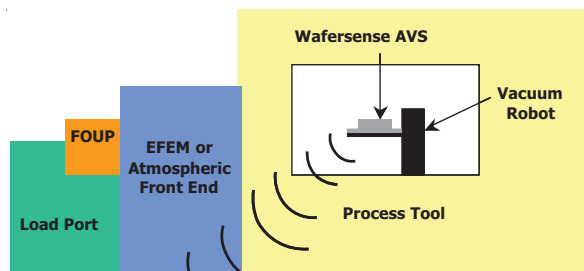
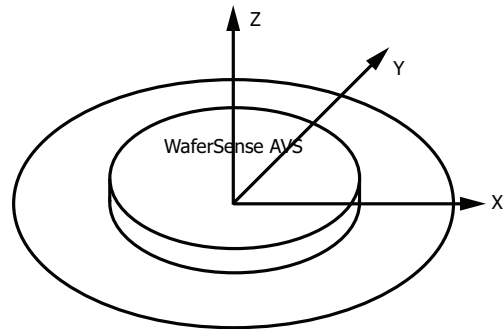
## How WaferSense AVS Works ...



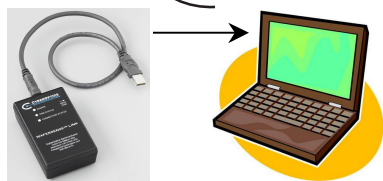
**Vibration sensor:** MEMS (microelectromechanical systems) accelerometers measure the acceleration of orthogonal axes of the wafer. The measured acceleration includes a component due to the Earth's gravity. Each surface micro-machined MEMS device measures the differential capacitance of a moving proof mass placed between fixed electrode plates of opposite polarity. The capacitance changes in response to changes in acceleration. The differential capacitance of the three electrodes is measured by an analog-to-digital converter. Proprietary technology is used to accurately convert the MEMS readings to accelerations expressed in terms of Earth's gravity.

### Orientation of acceleration sensors with respect to the AVS wafer:

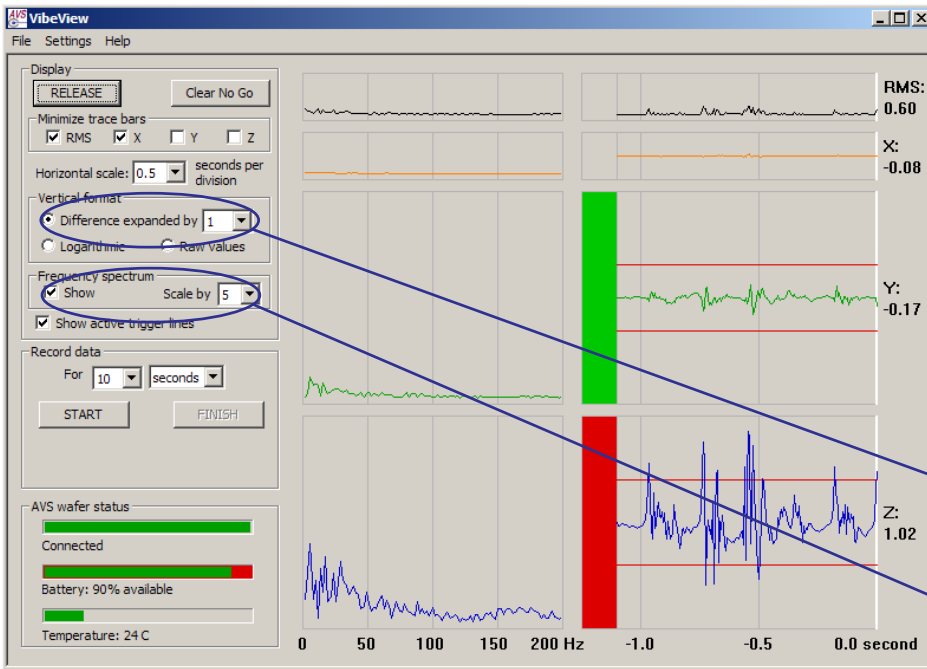
WaferSense AVS shows vibration measured in each of three orthogonal directions. Looking down on the wafer with the AVS logo at the top, the X trace shows horizontal movement to left and right, the Y trace shows horizontal movement to top and bottom, and the Z trace shows vertical movement.



**Wireless communication:** WaferSense AVS uses 2.4GHz RF (Bluetooth) wireless communication between the sensor and the link, which is connected to a PC. WaferSense AVS uses a Class 1 Bluetooth device, rated for unimpeded communication up to 100 meters.



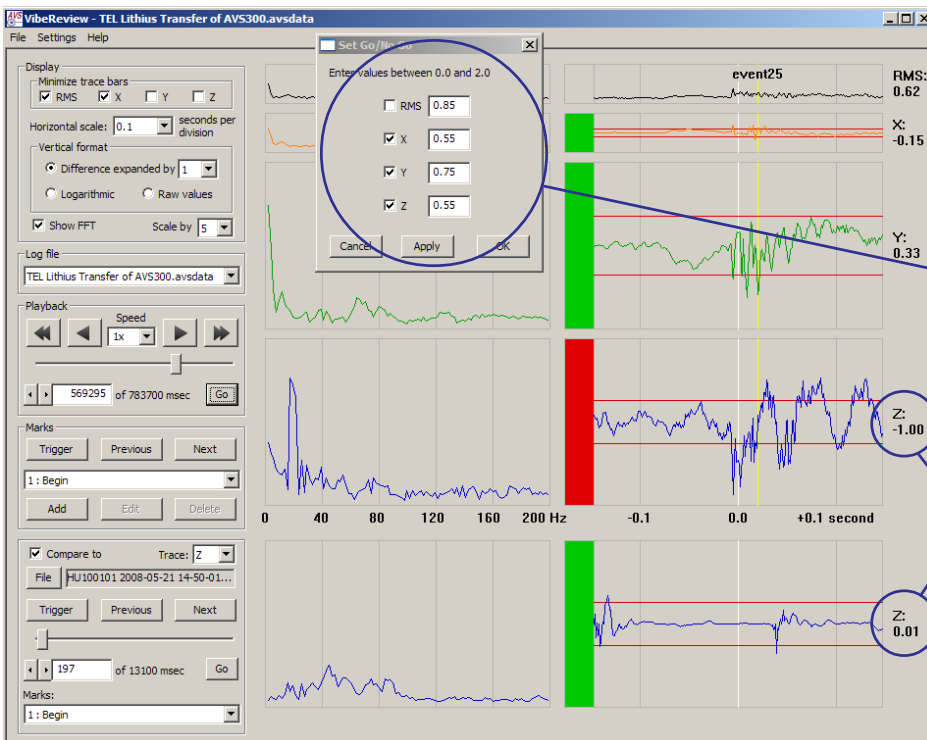
**Link & Laptop:** The link is a compact USB 1.1 compliant device that connects to a laptop or PC to enable wireless communication with the sensor.



## VibeView™ Software Application:

The AVS wafer continuously detects vibrations and transmits the readings (1,000 per second) to the VibeView application in real time. The Go/No Go feature in VibeView lets you monitor the traces for excessive levels of vibration, indicating when your specified levels are exceeded. You can record the vibration data, along with annotations, to a log file and play it back later. Parametric readouts for battery life, sensor temperature and connection status are also displayed.

- Set the trace display to show the difference between the instantaneous readings and the moving average.
- A Fast Fourier Transform real-time frequency analysis lets you display the frequency spectrum of the vibration data.



## VibeReview™ Software Application:

VibeReview can be used to display the contents of data files logged by VibeView. You can compare two VibeView log files to identify conditions that have changed between measurements taken with the AVS wafer.

- The Go/No Go feature in VibeReview lets you monitor the traces for excessive levels of vibration, indicating when your specified levels are exceeded.
- Comparing Z axis traces from two separate log files.