1.1 OVERVIEW

This manual describes how to set up and use the Opti-Probe 5000 (OP 5000) family of products. This family of products is used to non-destructively measure the thickness and optical parameters for one or more thin film layers by measuring the reflected light and modeling the film parameters that give results which most closely match the measurements.

Throughout this manual, the term "OP 5000" is used generically to represent all members of the product family. If features are only available on some configurations, it will be noted in the text.

1.2 THE MEASUREMENT TECHNOLOGIES

The OP 5000 integrates up to six different technologies for measuring films. Two of these technologies are proprietary to Therma-Wave. The six measurement technologies are the following:

- Beam Profile Reflectometry (BPR) – The BPR measures the reflected light at various angles through a single lens. The measured angular reflectivity curves are then compared with computer generated film models to determine the most likely composition of the actual film stack.

- Beam Profile Ellipsometery (BPE) – The BPE measures the integrated phase shift between two different orientations of the incident laser beam as it passes through the film stack. This information is used, in conjunction with theoretical models to determine the thickness of very thin films.

- Visible Spectrometer (VS) – The spectrometer measures the reflected light at various different visible wavelengths. The measured reflectivity curves are then compared to computer generated film models to determine the most likely composition of the actual film stack.

- Broad Band Spectrometer (BB) (some models) – The BB spectrometer is similar to the visible spectrometer except that the optical wavelengths used in the measurements are extended down to ultra-violet wavelengths.

- Absolute Ellipsometry (AE) (some models) – Absolute Ellipsometry is used to measure the phase shift between two different orientations of the incident laser beam as it passes through the film stack at a fixed angle. This information is used, in conjunction with theoretical models to determine the thickness of very thin films whose optical characteristics are known.

- Spectroscopic Ellipsometry (SE) (some models) – SE measures a parameter which is related to the phase shift of the incident light source as it passes through the film stack at a fixed angle. This information is used to directly measure the optical components of the film at many wavelengths.

1.3 FEATURES OF THE OP 5000

In addition to having the ability to measure the thickness of thin films, the OP 5000 incorporates the following features which enhance its usability and production worthiness:

- Non-destructive measurement
- Can measure up to seven different film parameters from up to seven different film layers.
- Submicron spot size for several measurement technologies
- Fully GEM/SECS compatible
- Can be set to measure etch/deposition rates
- Can be set to directly measure reflectivity
- Seven different default measurement types
- Fully functional vision processing system to accurately and repeatably find specific measurement sites on patterned wafers.
- High throughput