

ellipsometers

stokes laser ellipsometer LSE-USB

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stokes laser ellipsometer LSE-USB description

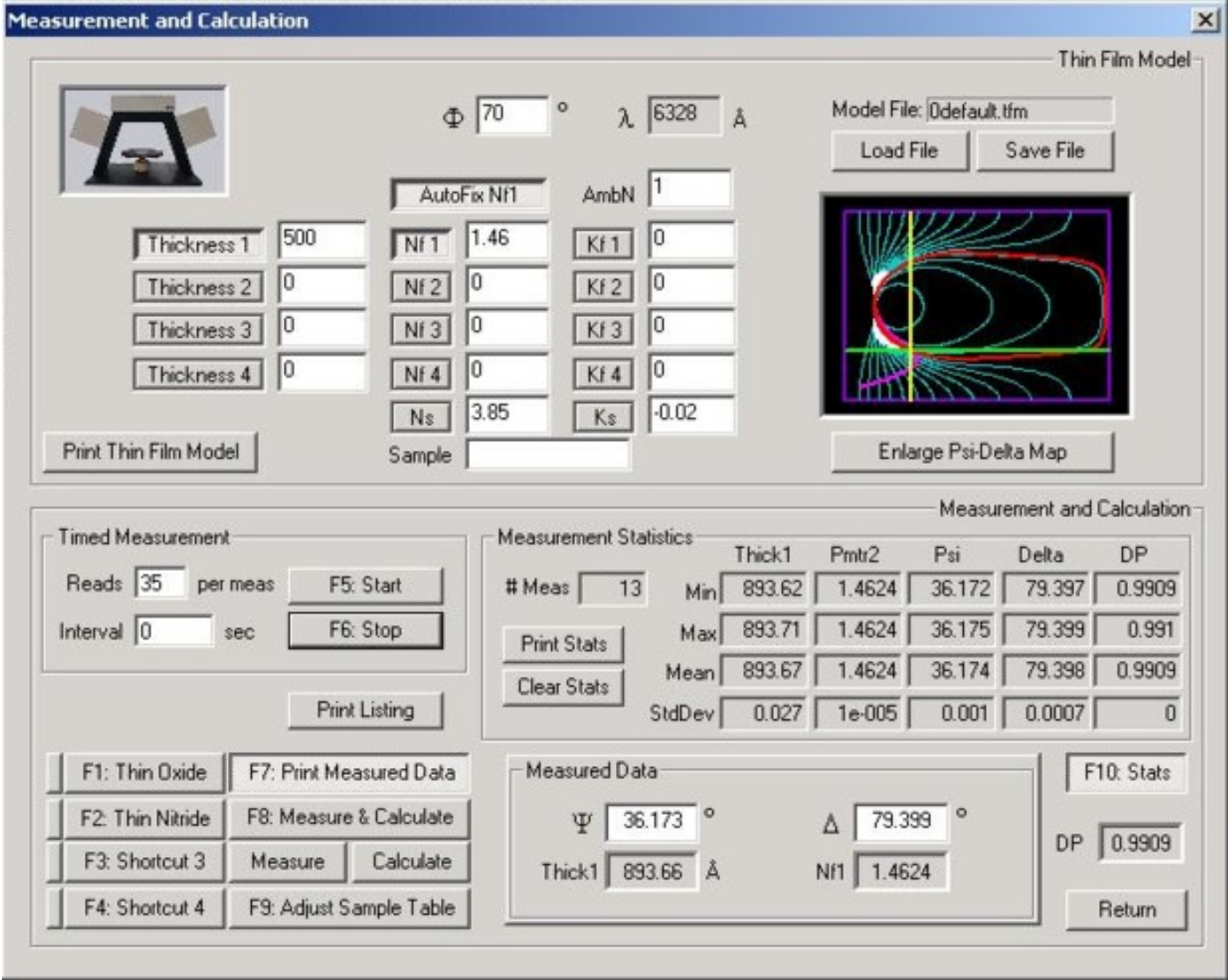
The model LSE-USB with convenient USB interface uses advanced [StokesMeter™](#) technology (previous winner of Photonics Spectra and R&D 100 best new products awards). The unit's simple robust design offers unprecedented ease of use and instantaneous measurement. It is a popular alternative to overly complicated ellipsometers for precise routine measurement.

Unlike other ellipsometers, [StokesMeter™](#) technology uses no moving parts and no modulators to quickly and accurately determine the complete polarization state of the HeNe laser measuring beam at a 70° incidence angle. The laser light source has ample light intensity for increased measurement accuracy of absorbing and rough scattering films. Laser sources have the added advantage of being spectrally precise, stable and long lasting. Lasers permit optimum instrument design using optics, detectors and other components so that measurements can be made highly accurate. The LSE-USB design features a small footprint yet it can accommodate large samples up to 300mm. The sample stage can be locked in place or easily moved by hand to measure any point on the sample surface. The stage includes a manual tilt and table height adjustment using an alignment screen on the computer.

high speed film thickness system measures routinely in less than a second!

features

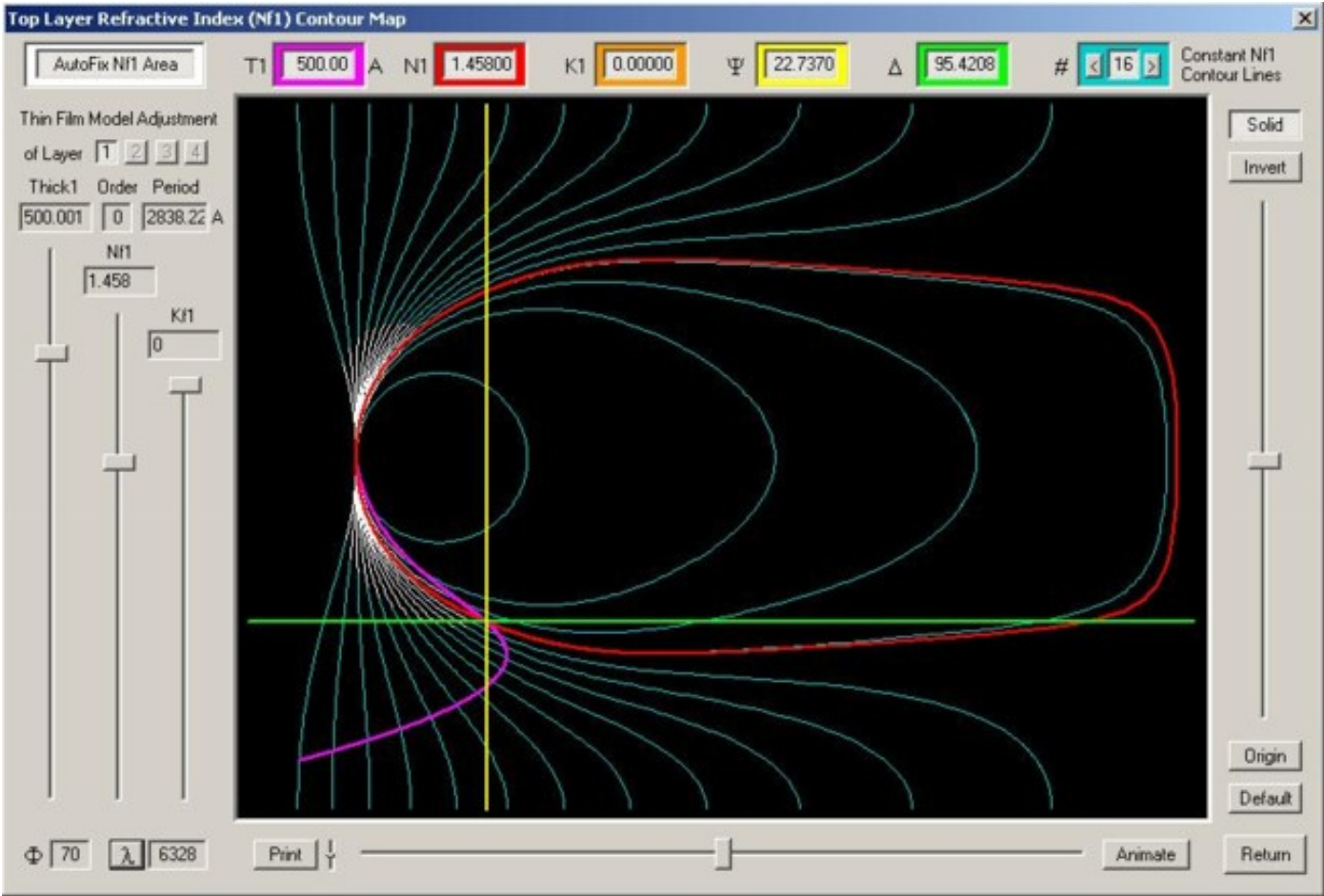
- Trouble-free, no moving parts advanced [StokesMeter™](#) measurement head.
- Measures complete state of polarization providing increased accuracy.
- Accurate, stable measurements using spectrally precise laser ellipsometry.
- Fastest possible instrument for thin film measurement.
- Tilt-free, focus free, hands-off operation for similar wafers.
- Simple, compact tabletop instrument - competitively priced.



gaertner ellipsometer measurement program LGEMP description

The LGEMP Windows software is versatile and can measure single layer films such as oxides, nitrides and photoresists as well the top layer on a known 1, 2, or 3 layer stack such as poly on oxide and oxide on poly on oxide. Monolayer organic films are an excellent application for the precision and stability of the model LSE-USB.

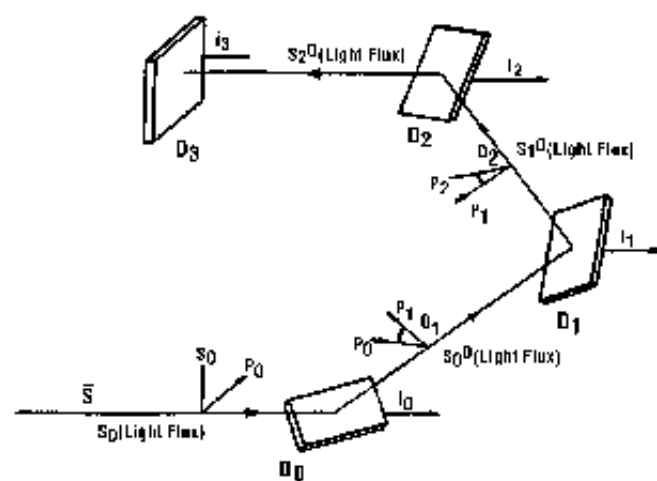
A "File Handler" enables saving and quick retrieval of frequently used measurement setup parameters. Four user-defined setup files can be assigned to one step "press-and-go" shortcut buttons for fast access of different measurement setups.



The **Enlarged PSI-Delta Map** within the LGEMP program permits theoretical "what if" type simulation of your Thin Film Model providing a deeper understanding of the film modeling. The top layer film Thickness T1(pink line), Refractive indexNf1(red line), Absorption Kf1(brown line), Y(yellow line), D(green line), with moveable sliders on the left side quickly show the effects of varying the model parameters on the film refractive index resolution and measurability. The aqua color lines are lines of constant film refractive index Nf1. The white lines are regions of Autofix of Nf1 where the index is not easily resolved in this region.

description of stokesmeter™ technology

This advanced device uses no moving parts and no modulators to quickly and accurately determine the complete polarization state of the measuring beam providing increased measurement accuracy.



The diagram above shows the [StokesMeter™](#) photopolarimeter for the simultaneous measurement of all four Stokes parameters of light. The light beam, the state of polarization of which is to be determined, strikes, at oblique angles of incidence, three photodetector surfaces in succession, each of which is partially spectrally reflecting and each of which generates an electrical signal proportional to the fraction of the radiation it absorbs. A fourth photodetector is substantially totally light absorptive and detects the remainder of the light. The four outputs thus developed form a 4x1 signal vector I which is linearly related, $I=AS$, to the input Stokes vector S . Consequently, S is obtained by $S=A^{-1}I$. The 4x4 instrument matrix A must be nonsingular, which requires that the planes of incidence for the first three detector surfaces are all different. For a given arrangement of four detectors, A can either be computed or determined by calibration.

technological advantage

The simple, compact **StokesMeter™** replaces a typical rotating analyzer assembly consisting of a drum, prism, encoders, switches, motor and detector and their associated electronics. In addition, the waveplate mechanism on the polarizer arm, is eliminated resulting in a fast, precise, no moving parts ellipsometer.

An outstanding feature is the Stokes Ellipsometer's compensation for small changes in angular beam deviation caused by sample out-of-flatness; thus permitting fast, uninterrupted measurement over the entire wafer surface without the need to pause to correct for focus and tilt. .

Extremely precise and stable the model LSE-USB Stokes Ellipsometer is an excellent value in a basic uncomplicated ellipsometer. The LSE-USB model ellipsometer ships complete with LGEMP Windows™ software, USB cable, 6 inch sample stage and reference wafer. It interfaces to your Windows™ PC or Laptop with a USB 2.0 port.

LSE-USB can be equipped with the following options:

Optional Small Spot optic LSS

Reduces standard 1 mm laser beam to 0.25 x 0.75 mm on sample
See our model [LSE-MS](#) for 15 x 45 micron on sample

Optional 8 inch Sample Stage L8

Substitutes 8 inch sample stage in place of standard 6 inch sample stage

Optional L-SCAT SOLAR CELL / SCATTERING SAMPLE MEASUREMENT

Rough scattering samples common in the solar cell industry are difficult to measure accurately with most ellipsometers because of the loss of signal strength and depolarization of the measurement beam. Although there are ways to boost the signal strength and capture more scattered light, dealing with depolarization is much more difficult and requires the determination of the complete state of polarization namely the measurement of the 4 stokes parameters S_0 , s_1 , s_2 , s_3 . Gaertner Stokes Ellipsometers do this naturally as our [StokesMeter](#) polarimeter is used as the ellipsometer's analyzer. This gives Stokes Ellipsometers the unique ability to instantly separate the polarized from the unpolarized components of the measuring beam thereby delivering a highly accurate measurement of film thickness and index based only on the totally polarized component of light. The L-SCAT scatter option includes a hardware modification to capture more of the scattered light from rough, textured surfaces and a program display of the degree of polarization P . However some samples are simply too rough and scatter too much light to be measured ellipsometrically.

Optional WIN 10 Laptop PC

With preloaded drivers and software and security cable

Optional Stokes Calibration Kit L118-KIT

Recalibrate any Stokes Ellipsometer using 4 Gaertner traceable wafers plus glass (L118G-KIT) or 4 NIST traceable wafers plus glass (L118N-KIT). Most users will not require ellipsometer recalibration. Intended for the most exacting semiconductor manufacturers with extremely tight tolerances and regulatory compliant users.

stokes ellipsometer LSE-USB specifications

Alignment:	Manually adjusted tilt and table height using computer alignment screen.
Incidence Angle:	70°
Method of Measurement:	Advanced StokesMeter™ determines the complete measuring beam polarization using no moving parts and no modulators, only 4 stationary silicon detectors so measurements are stable and exact.
Measurement Time:	Practically instantaneous
Measuring Laser:	6328Å HeNe Gas Laser with 1mm measuring beam diameter
Alignment Laser:	670nm Laser Diode
Sample (Wafer) Size:	300 mm wide X unlimited length
Stage:	6 inch hand positioning table with tilt and table height adjustment.
Software:	Windows™ LGEMP 4 layer program included.
Required Computer:	Windows™ desktop or laptop with USB 2.0 port (not included)

Film Thickness Range:	0 - 60,000 Angstroms on substrate or on 1, 2, 3, or 4 known sublayers.
Precision & Repeatability:	Sub-Angstrom over most of the measurement range.
Refractive Index:	± .0005 over most of the measurement range.
Power:	100V-240V, 50-60Hz., 1 A
Dimensions:	Height: 16.5 Width: 27.5 Depth: 16 inches Net Weight: 45 lbs. Shipping Weight: 65 lbs.
CDRH Compliance:	All laser ellipsometers supplied by Gaertner comply with CDRH requirements 21CFR 1040 for a Class II laser product emitting less than 1 mW or Class IIIb less than 5 mW of low power radiation. As with any bright source such as the sun or arc lamp, the operator should not stare directly into the laser beam or into its reflection from highly reflecting surfaces.
CE Compliance:	Stokes Ellipsometers comply with European safety directives and carry the CE mark.
Warranty:	1 year warranty covers all parts and labor exclusive of shipping costs

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