

Excellence in Thin Film Metrology

PZ2000

Automatic
Laser Ellipsometer/Reflectometer
Measurement of thickness,
Refractive index and reflectivity



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EMISSION • FLUORESCENCE • FORENSICS • GRATINGS & OEM • OPTICAL SPECTROSCOPY • RAMAN • THIN FILM



PZ2000 - Automatic Laser Ellipsometer/Reflectometer

• Key applications

- Ultra-thin gate oxides
- High-k & low-k dielectrics
- 193 nm ARC and resist
- High-k dielectrics
- SOI and poly-Si on oxide
- Multi-layer stacks e.g. low-k stack, OPO, ONO
- Harddisk, magnetic head and CD process control



• Product description

The PZ2000 is an automatic thin-film measurement system for substrates of up to 300 mm diameter.

Based on the technique of ellipsometry and reflectometry, the tool is capable of determining the thicknesses, refractive index, absorption constants and reflectivity of thin films from 0 nm up to several microns.

Three options are available:

- PZ2000 LE Laser Ellipsometer
- PZ2000 R Reflectometer
- PZ2000 LE/R Laser Ellipsometer/Reflectometer

• Features

The PZ2000 can be used in both R&D and production environments.

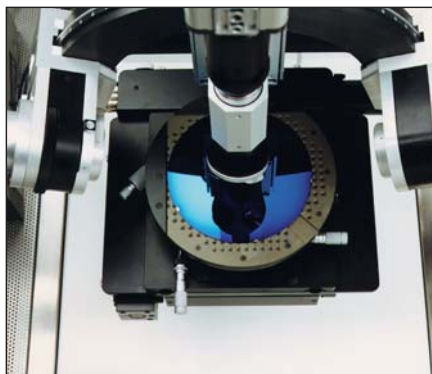
Transparent films – such as oxides, nitrides, high-k and low-k dielectrics – can be analysed, as well as absorbing films such as a-Si, polysilicon and polyimide. Simultaneous evaluation of multilayers, e.g. ONO, OPO or CMP films, can be carried out using the infrared option DIR (Double InfraRed).

This also allows the characterisation of polysilicon or a-Silicon with respect to refractive index and k-value at HeNe wavelengths.

- Cost effective
- Large installed base
- Excellent long term stability
- Samples up to 300 mm
- Small footprint

Thick films of up to several microns can be measured without any order ambiguity.

The system offers full upgradability - from basic to fully automatic optics. Using μ -spots, it is capable of measuring patterned wafers, with pattern recognition as an additional option.



Laser optics and precision x-y stage

*Measure
of Thickness
Refractive
and Reflectivity*

**The Tools to
Dielectric**



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• **Process control for HD / CD**

The PZ2000 is also ideally suited for process control on Harddisks, CD glass masters, CD- R, CD-RW, DVD, mini disks as well as thin-films for magnetic heads.

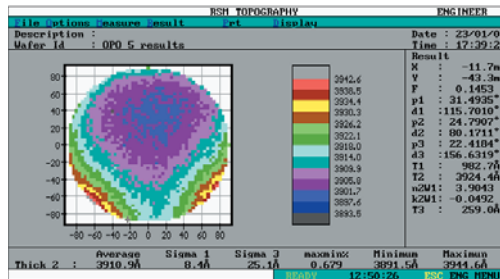
- Ultra-thin carbon films < 50Å
- Carbon t&k analysis
- Long-term stability
- Table top unit / small footprint
- Cost effective

• **Options**

- Microspot optics for in-structure measurement
- Autofocus system for focusing of each measurement point
- Infrared sources for e.g. polysilicon, CMP and resist
- Microscope with CCD camera
- Custom tailored substrate holders
- Stainless steel working bench
- Various software options including SECS/GEM, SPC and multilayer modules
- Pattern recognition system for operator-free measurement

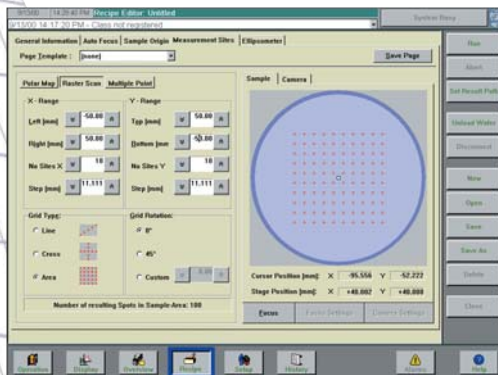
• **Software**

For PZ2000 systems featuring automatic stages and the autofocus option, we now offer state of the art PQ Diamond software, Windows NT® based. As one of the first of its kind, PQ Diamond is fully E95-0200 compliant.

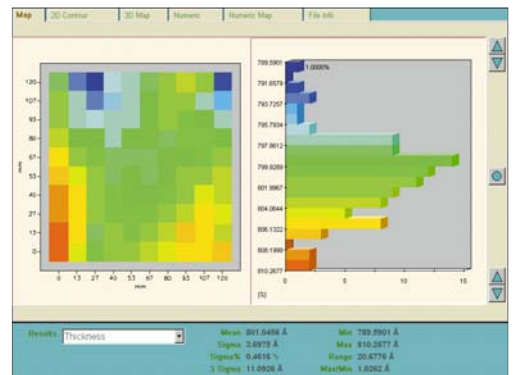


For PZ2000 systems with our manual stage option we offer our reknown SD-DOS software

and
Transparent
Films



Window for recipe set up of measurement sites



Film thickness map output

Specifications

	PZ2000 (LE)	PZ2000 (R)	PZ2000 (LE/R)
Metrology	Laser Ellipsometer	Reflectometer	Laser Ellipsometer & Reflectometer
Light sources	Lasers	Halogen light bulb	Lasers/Halogen light bulb
Wavelength range	HeNe laser	$\lambda=350-1000$ nm (VIS-NIR)	HeNe laser / $\lambda=350-1000$ nm
Spot size	0.8 x 2.4 mm	\varnothing 10 μ m	0.8 x 2.4 mm / \varnothing 10 μ m (VIS)
Optional wavelength range	Laser with: 790 nm 1300 nm 1550 nm	Halogen-Deuterium bulb $\lambda=186-1000$ nm (UV-VIS-NIR)	Laser with: 790 nm 1300 nm 1550 nm Halogen-Deuterium bulb $\lambda=186-1000$ nm (UV-VIS-NIR)
Spot size options	Microspot for Laser Ellipsometer: 50 x 150 μ m 30 x 90 μ m 10 x 30 μ m	Microspot for Reflectometer: \varnothing 20 μ m (UV-VIS-NIR) \varnothing 10 μ m (VIS)	Microspot for Laser Ellipsometer: 50 x 150 μ m 30 x 90 μ m 10 x 30 μ m Microspot for Reflectometer: \varnothing 20 μ m (UV-VIS-NIR)
Film thickness range	0 to 10 μ m	20 nm to 30 μ m	0 to 30 μ m
Precision	< 0.01 nm	< 1 nm	< 0.01 nm / < 1 nm
Accuracy	< 0.01 nm	< 1 nm	< 0.01 nm / < 1 nm
Measurement time	< 1 sec/pt	0.5 to 5 sec/pt	< 1 sec/pt / 0.5 to 5 sec/pt
Sample sizes	Up to 300 mm	Up to 300 mm	Up to 300 mm
Microscope viewing field	High resolution: 0.5 x 0.7 mm Low resolution: 2.0 x 2.8 mm	High resolution: 0.5 x 0.7 mm Low resolution: 2.0 x 2.8 mm	High resolution: 0.5 x 0.7 mm Low resolution: 2.0 x 2.8 mm
Manual stage	High-precision	High-precision	High-precision
XYZ Motor stage optional high precision	\pm 30 μ m \pm 2 μ m	\pm 30 μ m \pm 2 μ m	\pm 30 μ m \pm 2 μ m
Autofocus system	Optional	Optional	Optional
Pattern recognition	Cognex (optional)	Cognex (optional)	Cognex (optional)
Footprint	0.80 x 0.75 m	0.80 x 0.75 m	0.80 x 0.75 m
Weight	approx. 200 kg	approx. 200 kg	approx. 200 kg
GEM/SECS	Optional	Optional	Optional
Clean room compatible	Class 1	Class 1	Class 1
CE compliant	Yes	Yes	Yes
SEMI norm	S2-93 compliant	S2-93 compliant	S2-93 compliant
Uptime	> 98 %	> 98 %	> 98 %
MTTR	< 2 h	< 2 h	< 2 h
MTBF	> 5000 h	> 5000 h	> 5000 h

Thin Film Division is a worldwide specialist in Process Control and Ellipsometry



Digilem Interferometric Camera



UVISEL Spectroscopic Ellipsometer



UT300 Fully Automatic SE



PQ Ruby SW SE

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