SPECIFICATIONS -- MODEL 2010 PRISM COUPLER

Measurement accuracy and resolution:

index accuracy:	±.001	index resolution:	±.0005
thickness accuracy:	±(0.5% + 50 Å)	thickness resolution:	±0.3%

Precise accuracy and resolution values depend on film type and thickness range. Figures are typical of films in the 0.5-1.0 micron thickness range with low resolution rotary table. Accuracy and resolution figures improve for thicker films or if optional high resolution rotary table is used (see below).

Refractive index measuring range: With standard prisms, films and bulk materials with refractive index 2.45 and below are measurable. In addition, films with index up to 2.70 are sometimes measurable, depending on film thickness.

Film types/thickness ranges measurable: The Model 2010 can measure virtually any film type which is not metallic or very highly absorbing at the operating wavelength. Thickness and index of one or both films of dual film layers are measurable, provided the top film has higher refractive index. Thickness must exceed a minimum threshhold which depends on film and substrate (or underlying film) index. Examples of thickness ranges measurable* for common single or upper film types at the standard (633 nm) operating wavelength (for other film types, interpolate between example films with closest index):

Film type/index	Thickness and index measurement**	Thickness only (assume index)
Silicon dioxide (n=l.46) over Si	0.48-15 μ	0.20-0.48 μ
Photoresist (n=l.63) over Si	0.42-15 μ	0.18-0.42 μ
Photoresist (n=l.63) over Silicon dioxide	0.70-15 μ	0.30-0.70 μ
Polyimide (n=l.72) over Si	0.38-15 μ	0.15-0.38 μ
Polyimide (n=l.72) over Silicon dioxide	0.50-15 μ	0.16-0.50 μ
Si oxynitride (n=l.80) over Si	0.35-15 μ	0.14-0.35 μ
Si oxynitride (n=l.80) over Silicon dioxide	0.45-15 μ	0.13-0.45 μ
Si nitride (n=2.0) over Si	0.32-15 μ	0.12-0.32 μ
Si nitride (n=2.0) over Silicon dioxide	0.30-15 μ	0.15-0.30 μ

*High-index films over substrates or underlying films of lower index other than Silicon dioxide are sometimes measurable at thicknesses up to half as thin as the above limits. Optional shorter wavelengths are also available to extend the measuring range to thinner films. Please consult Metricon for details.

**Maximum thickness for which simultaneous thickness/index measurement is possible is approximately 15 μ for all film types. However, using bulk index measurement (see below), accurate index-only measurements of films thicker than 5-7 μ may be made, and, with VAMFO option, thickness-only measurements may be made on films as thick as 100 μ.

Typical measurement time: 10-25 seconds with standard table, 15-75 seconds with high resolution table.

Index-only measurement of bulk materials/thick films: Materials must be transparent/semi-transparent. Maximum index measurable with standard prisms is 2.45. Accuracy and resolution are ±.001 and ±.0005, respectively. Typical measurement time for bulk measurement is 5-20 seconds (bulk measurement only).

Operating wavelength: Low power (0.5 mw nominal) He-Ne laser (632.8 nm), CDRH/BRH Class II. Optional shorter wavelengths for measurement of thinner films, and near-IR wavelengths for fiber/integrated optics applications, are available. Multiple wavelength sources are also available. Optional lasers may change CDRH safety class to IIIa or IIIb.

Substrate materials/sizes: Film measurements may be made on virtually any polished substrate material including silicon, GaAs, glass, quartz, sapphire, GGG, and lithium niobate. For transparent substrates,

film and substrate index should differ by approximately .05 or more. Standard unit accepts substrates up to 6" (150 mm) square, with 8" (200 mm) capability optionally available.

Measurement area: While the film and measuring prism are in contact over an area roughly 8 mm square, film area actually measured is only 1 mm diameter.

Prism types: Four standard prism types are available for measurement of films in various index ranges. Prisms are easily interchangable in approximately one minute to permit use of more than one prism type with a single system:

Prism type	Index range	Comments
200-P-1	<1.80	low wear, optimum for low index (<1.80) films
200-P-2	1.70-2.45	optimum for high index (>2.10) films
200-P-3	<2.10	broad application range
200-P-4	<2.02	low wear, broad application range

200-P-2 and 200-P-3 prisms eventually become abraded with use and must be replaced after a typical life of 8,000-10,000 measurements.

Rotary table step size: 3.0 or 1.5 minutes, keyboard selectable. Higher resolution tables (0.9/0.45 or 0.6/0.3 minutes) are also available as a no-charge option. Higher resolution tables are recommended when film thickness exceeds 5-7 μ, or when improved index resolution is required. In some applications, higher resolution tables will increase measurement time.

PC requirements: IBM-PC or compatible with 10 Mhz 80286 processor (minimum), 80287 math coprocessor, 640K RAM (minimum), 20 Mb (minimum) hard disk, VGA video display, keyboard with 12 function keys, printer, and Microsoft mouse.

Output devices: Prompts and results are displayed on the computer's VGA video terminal. Hardcopy of results and mode patterns can be made to the system printer.

Services required: AC outlets for laser power supply, interface module, and printer (0.5 amp each) and PC (2.0 amps). 60 psi air (.01 cfm). Unit can be mounted on ordinary bench top -- vibration isolation not required.

Dimensions: Overall system installation requires an area of 40 in (101 cm) wide, 24 in (61 cm) deep, 15 in (38 cm) tall. Total system weight is 84 lbs (38 kg). Individual dimensions/weights:

Optical module: 15 in (38 cm) wide, 22 in (56 cm) deep, 12 in (30 cm) tall/40 lbs (18 kg).
Computer: 12 in (30 cm) wide, 15 in (38 cm) deep, 15 in (38 cm) tall/42 lbs (19 kg).
Interface/printer: 10 in (25 cm) wide, 7 in (18 cm) deep, 3 in (8 cm) tall/2 lbs (1kg).

The above specifications apply to the Model 2010 when the system is operated in the standard prism coupling mode for measurement of thickness and index of thin films, or refractive index of bulk materials. For specifications when used in the optional VAMFO mode for non-contact measurement of film thickness only, please see separate section on VAMFO option #2010-VO.