mti instruments

A worldwide leader in precision measurement solutions

High Speed
Multi-Channel,
TTV and Bow

PROFORMA™ PV-1000

Measurement Module for In-process Monitoring of Solar/Photovoltaic Wafers

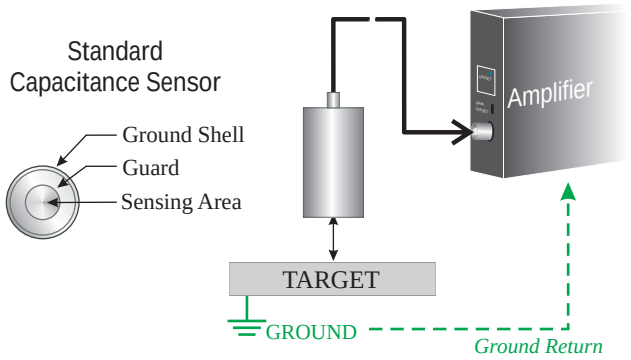
MULTIPLE MODULAR TYPE AMPLIFIERS CAN BE CHAINED TOGETHER FOR UNLIMITED LINE SCANS ON THE WAFERR

Advanced Features

- Up to three thickness channels per rack
- Minimum, maximum, average and total thickness variation measurements
- Bow measurement (3 probe pairs required)
- Integrated data aquisition and control electronics
- Fast Ethernet communications ports for production rates up to 5 wafers per second
- Scalable for increased number of thickness line scans
- Digital I/O for interface with existing wafer handling equipment
- Windows® based control program for local or remote data monitoring
- Windows® based DLL package for integration with existing control PC's
- Standard and custom probe sizes available
- Exclusive MTII push/pull capacitance probes work with all wafer types

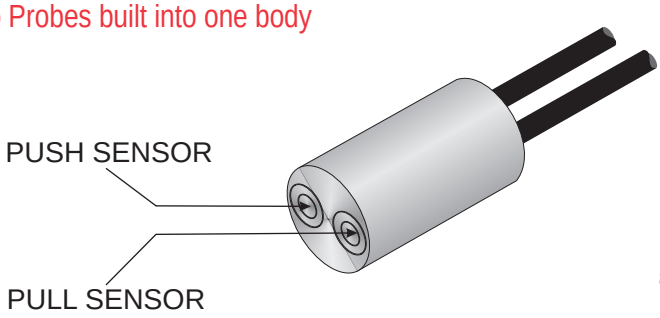
Capacitance Technology:

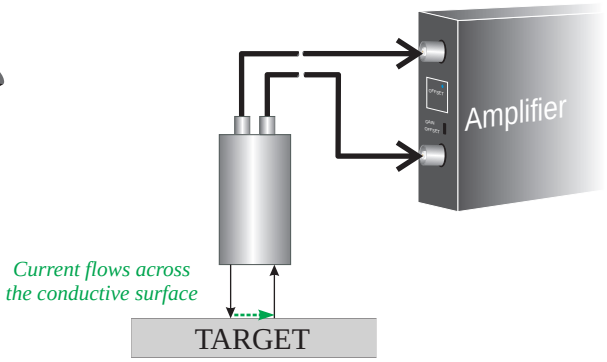
Standard capacitive sensors require the target to be electrically grounded. Current flows from the probe face to the target and back to the amplifier to complete the circuit. The capacitance between probe and target is proportional to the distance and converted to a 0 - 10V output from the amplifier. The measurement of electrically grounded targets can be, however, affected by changes in the electrical conductivity or ground path of the target.



Unique Push/Pull Technology:

Two Probes built into one body





To eliminate the effects of these variations, MTII developed a unique version of the Accumeasure sensor called the push-pull. In this design each probe consists of two capacitance sensors, built into one probe body. Each sensor is driven at the same voltage, however, there is a 180 degree phase shift between signals. This shift allows the current path to travel across the target surface rather than through the target to ground, eliminating any inaccuracies created by poorly grounded targets. Additionally, highly resistive targets can be measured with this technology allowing capacitance sensors to be used on semi-insulating and semi-conducting targets.

Additionally, the push/pull amplifier design cancels common mode electrical noise that may be induced in this target. Common mode noise may be encountered in magnetic bearing surfaces, brake rotors and air bearing floating surfaces.

Applications:

Slicing
- Thickness
- TTV

Degradation
- Wire gauge re-grooving
- Blade replacement
- Wire guide re-grooving
- Blade replacement

Lap/Etch and Polishing
- Process monitoring
- Thickness
- TTV
- Etch material removal rate

Final Inspection
- Lot Sampling
- Final Thickness

PV-1000 Wafer Metrology Systems

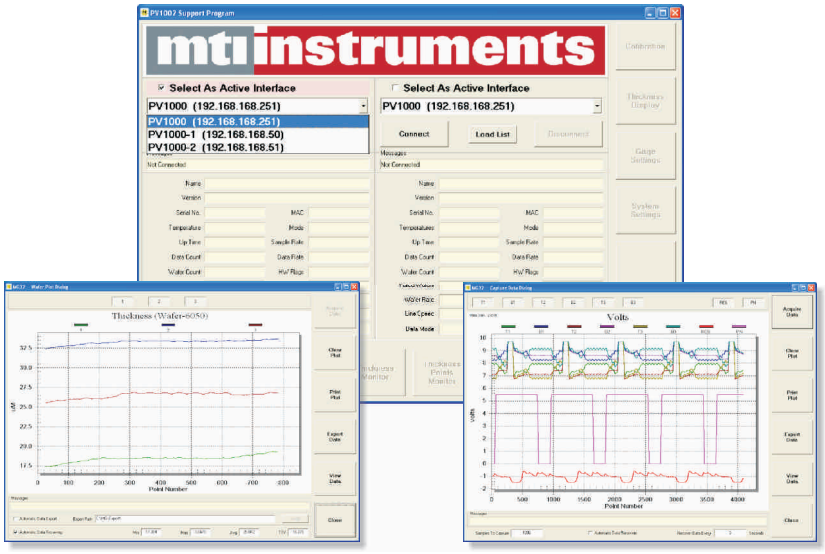
The PV-1000 solar wafer measurement series are ideal for both process development and production environments. Using MTII's exclusive Push/Pull™ capacitance probe technology, each PV-1000 module provides up to three pairs of probes for measurement of maximum, minimum and average thickness, as well as total thickness variation (TTV) and wafer bow.

For applications requiring additional thickness channels, multiple PV-1000 modules can be chained together for unlimited line scans on the wafer.

Integrated data acquisition and control electronics analyze and transmit wafer data via the on-board Ethernet port at speeds of up to five wafers per second. The digital I/O port allows communication with wafer handling equipment for up to 64 classes of wafer sorting and binning. Remote monitoring capabilities allow you to see your production line data across your network or directly at the module.

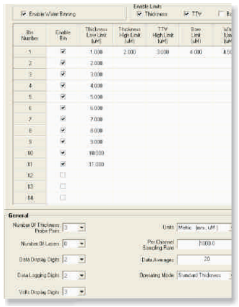
Complete System Intergration

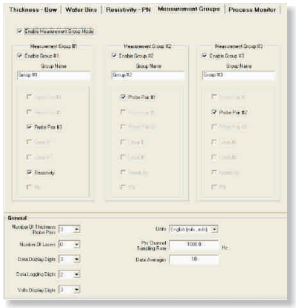
Each PV-1000 module comes with a software package for easy integration into your existing production line. Our Windows® based interface package allows for quick set-up, calibration and data monitoring at the module or across your Ethernet network.



Multiple PV-1000 modules can be monitored from a single location using standard TCP/IP protocols.

Integrated data acquisition and control electronics analyze and transmit wafer data via the on-board Ethernet port at speeds of up to seven wafers per second. The digital I/O port allows communication with wafer handling equipment for up to 64 classes of wafer sorting and binning. Remote monitoring capabilities allow you to see your production line data across your network or directly at the module.





For users who want to integrate the PV-1000 into an existing control computer, MTII also supplies a Windows® DLL software package standard with each system. The DLL allows access to every function and measurement performed by the PV-1000.

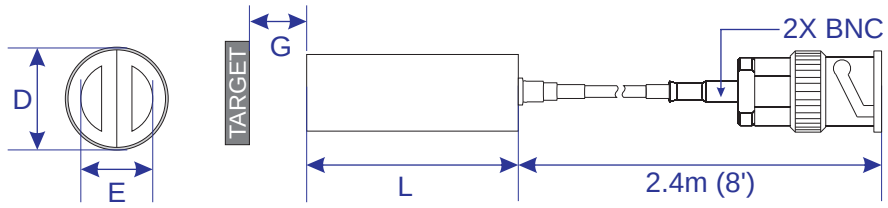
Features:

- Up to three thickness channels per rack
- Minimum, maximum, average and total thickness variation measurements
- Bow measurement (3 probe pairs required)
- Optional eddy current sensors for measuring wafer resistivity.
- Scalable for increased number of thickness line scans
- Fast Ethernet communications port for production rates up to 5 wafers per second
- Digital I/O for interface with existing wafer handling equipment

PV-1000 Pobes

ASP-14D-ILA/PP

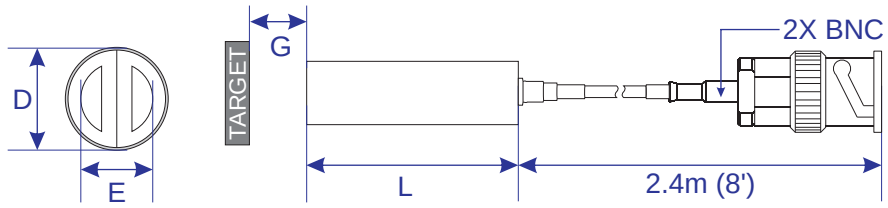
E	11.58 mm (0.456 inch)
D	20 mm (0.787 inch)
L	100 mm (3.937 inch)



Part #	Range		Min. Range		Spot Size		Linearity	Range Extension	Resolution (RMS) at 10 Hz	
	µm	*mils*	µm	*mils*	mm	*Inch*	% FSR		nm	*µi*
8000-6938	2540.0	*100.0*	88.9	*3.50*	11.6	*0.456*	0.02%	7X	10.0	0.39

ASP-10D-ILA/PP/EXT

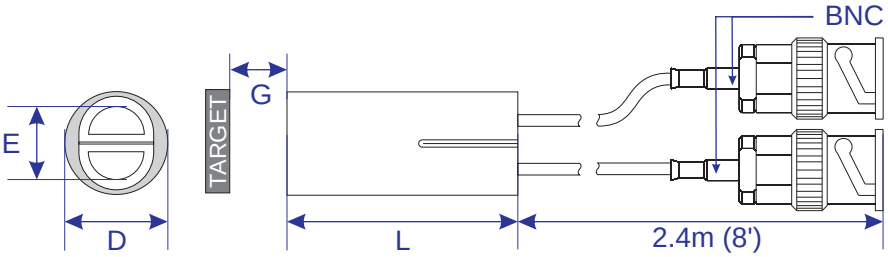
E	11.58 mm (0.456 inch)
D	16 mm (0.63 inch)
L	100 mm (3.937 inch)



Part #	Range		Min. Range		Spot Size		Linearity	Range Extension	Resolution (RMS) at 10 Hz	
	µm	*mils*	µm	*mils*	mm	*Inch*	% FSR		nm	*µi*
8000-6940	1778.0	*70.0*	63.5	*2.50*	11.6	*0.456*	0.02%	7X	10.0	0.39

ASP-10D-ILA/PP

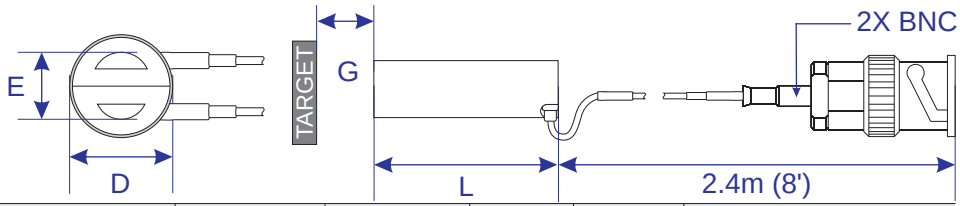
E	9.45 mm (0.372 inch)
D	14.8 mm (0.583 inch)
L	34.04 mm (1.34 inch)



Part #	Range		Min. Range		Spot Size		Linearity	Range Extension	Resolution (RMS) at 10 Hz	
	µm	*mils*	µm	*mils*	mm	*Inch*	% FSR		nm	*µi*
8000-6942	1778.0	*70.0*	63.5	*2.50*	9.4	*0.372*	0.02%	7X	10.0	0.39

ASP-10D-ILR/PP

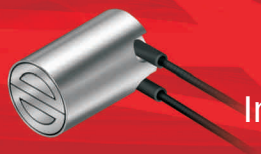
E	7.11 mm (0.28 inch)
D	16 mm (0.63 inch)
L	50 mm (1.969 inch)



Part #	Range		Min. Range		Spot Size		Linearity	Range Extension	Resolution (RMS) at 10 Hz	
	µm	*mils*	µm	*mils*	mm	*Inch*	% FSR		nm	*µi*
8000-6944	1778.0	*70.0*	63.5	*2.50*	7.1	*0.280*	0.02%	7X	10.0	0.39

Probe Connector Types:

ILA
Integrated Lead Axial

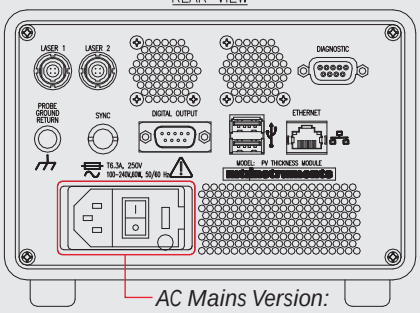


ILR
Integrated Lead Radial

Specifications

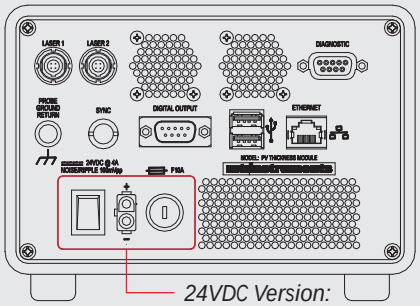
Wafer Types	Mono or Poly-Crystalline Silicon
Surface Types	As-Cut, Lapped, Etched, SiN Layer
Interface	Ethernet
Data Output	TCP/IP
Data Triggering	Automatic
Rack Dimensions	455 x 175 x 125 mm (LxWxH)
Power Requirements	AC (DC Version also available, *call MTII for information*)

REAR VIEW



AC Mains Version:
100 to 240VAC, 50/60Hz, 60W

REAR VIEW



24VDC Version:
22 to 26VDC, 95W continuous

Thickness Measurement

Probe Range	1778 µm / 70 mils	2540 µm / 100 mils
Measurement Accuracy	±0.25 µm / ±0.010 mils	±0.75 µm / ±0.030 mils
Repeatability	0.05 µm / 0.002 mils	0.10 µm / 0.004 mils
Distance between sensors	3.4 mm / 0.134 in	5.0 mm / 0.197 in

Custom probe sizes and measurement ranges available

Optional Accessories

Product #	Product Description	Model Name
	90 Ω Low Noise Extension Cable	
7500-6027-05	1.2 meters (4 feet) length	BNC-M to BNC-M Extension Cable
7500-6027	2.4meters (8 feet) length	BNC-M to BNC-M Extension Cable
7500-6027-12	3.6 meters (12 feet) length*	BNC-M to BNC-M Extension Cable
	BNC Coupler	
2100-2104	BNC Adapter to join two Extension Cables	BNC-F to BNC-F Adapter
8000-4174	**Probe Calibrator**	KD-CHIIID *(FIGURE 1)*
2100-1876A	**BNC-BNC Bulkhead Feed Thru**	BNC-F to BNC-F Bulkhead Feed Thru

xxx-**M** = Male Type Connector
xxx-**F** = Female Type Connector

* Max cable length of 15m (50'). Cables longer than 2.4m (8') will degrade linearity proportionally

Calibration and Fixturing

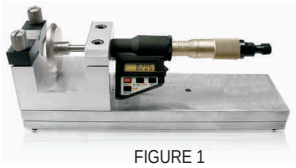


FIGURE 1
KD-CH-IIID calibrator

The KD-CH-IIID™ is a precision fixture that secures a non-contact displacement sensor and accurately varies the position of a target relative to the sensor. It provides an excellent means of obtaining calibration data at the user's facility.

Applications:

Slicing
- Thickness
- TTV

Degradation
- Wire gauge re-grooving
- Blade replacement
- Wire guide re-grooving
- Blade replacement

Lap/Etch and Polishing
- Process monitoring
- Thickness
- TTV
- Etch material removal rate

Final Inspection
- Lot Sampling
- Final Thickness

Tips for Quick Ordering Process

Modular Rack Systems

For measuring thickness of solar wafers or semiconductor wafers in automated track systems.

Select Model

All models below includes amplifier card rack with interface electronics.

Proforma PV-1000 Models	Description	Product #
1-Channel	2 amplifier cards, software and communication interface for one (1) thickness channel	8000-4316-001
2-Channels	4 amplifier cards, software and communication interface for one (2) thickness channels	8000-4316-002
3-Channels	6 amplifier cards, software and communication interface for one (3) thickness channels	8000-4316-003

Select Push/Pull Probes

Push/Pull Probes
Refer to Push/Pull Probe List on Page 4

IMPORTANT NOTE:
2 Probes required per channel

Custom Probes are also available
Contact MTII for your requirements

Replacement Parts	Description	Product #
PV Thickness Module Rack	Amplifier card rack only	8000-4311
Amplifier Module with Filter	7x Push amplifier module with 660Hz Bessel filter ordered as a kit. *NOTE: 2 modules are needed per thickness channel*	8000-4312

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