

Standard Capacitance Probes Provide  
Stable and Precise Non-Contact Measurement  
with Nanometer Resolution

# CAPACITANCE PROBES

LOW NOISE HIGH LINEARITY

HIGH RESOLUTION CUSTOMIZABLE

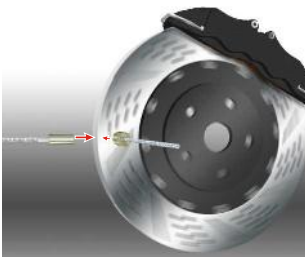
SUB NANOMETER ACCURACY



MTI ALSO DESIGNS CUSTOM CAPACITIVE PROBES THAT  
CAN MEET YOUR MEASUREMENT REQUIREMENTS

## Capacitance Sample Applications

- Microscope focus
- Lens alignment
- Part profiling
- Part tilt
- Semiconductor wafer thickness
- Piezo stage displacement
- Vibration measurement
- Computer disk run out and thickness
- Brake rotor warp and thickness
- Sheet metal thickness
- Photovoltaic wafers



Brake Rotor Coning, Warping and Run-out



Lobing and Flatness of Spindles

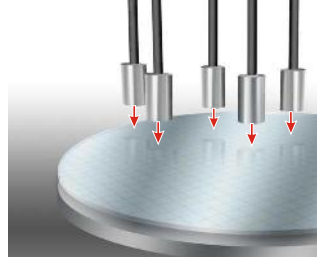
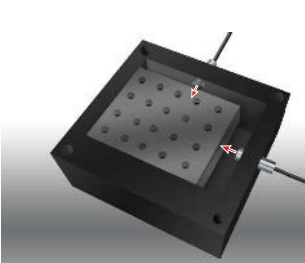


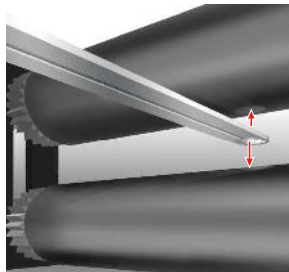
Plate Tilt, Flatness and Alignment of Semiconductor Reticle



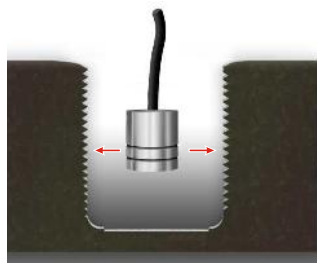
High Precision Microscope Lens Focusing



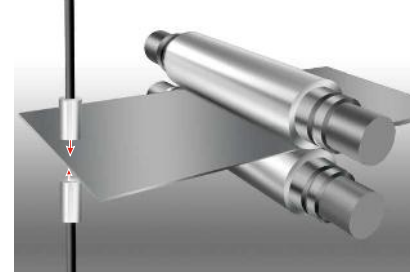
Nanometer Precision for Hysteresis of Piezo Stages



Gap Measurement for Extruders and Roller Gaps



Internal Fine Pitch Thread Inspection

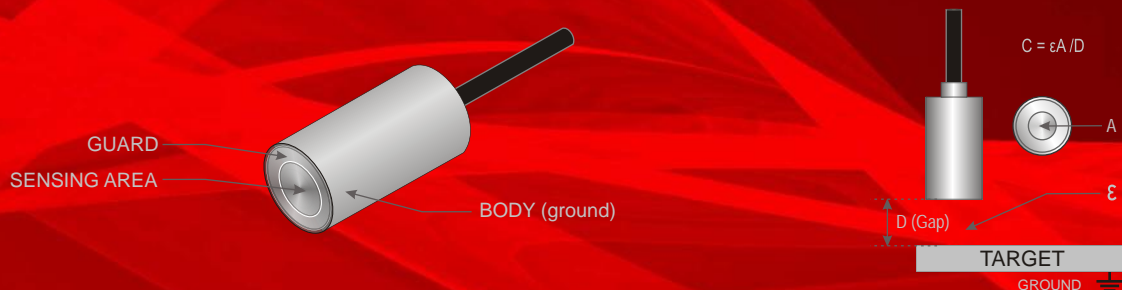


Accurate Sheet Metal Thickness with Spatial Averaging

## MTI Probe Standard Features

- Cable and Probe Temperature Rating: -130°C (-202°F) to 200°C (392°F) (see next page for high temperature probes)
- Connector Temperature Rating: -65°C (-85°F) to 85°C (185°F)
- Accuracy:  $\pm 0.02\%$  FSR or better, of range when probe and amplifier are calibrated to a known standard
- Standard Amplifier Filter Bandwidth: 500Hz
- Optional Filter Bandwidth: 10Hz, 100Hz, 1kHz, 2kHz, 5kHz and 660Hz-Bessel
- <sup>1</sup>Resolution RMS:  $(0.000423 \times \text{bandwidth in Hz} + 1.2) \times 0.00002 \times \text{FSR in Mils or Microns}$
- Probe and Cable Interchangeability: Accurate to within  $\pm 0.5\%$  without recalibration
- Pressure Rating Standard: 1400kPa (200 psig) - (not applicable to HT Probes)
- Material: Stainless steel construction, no active internal electronics
- Standard Coax Cable for Integral Lead Type Probes: 2.4m (8') length (see options for extension cables. Connector type probes require selection of cable assembly upon ordering)

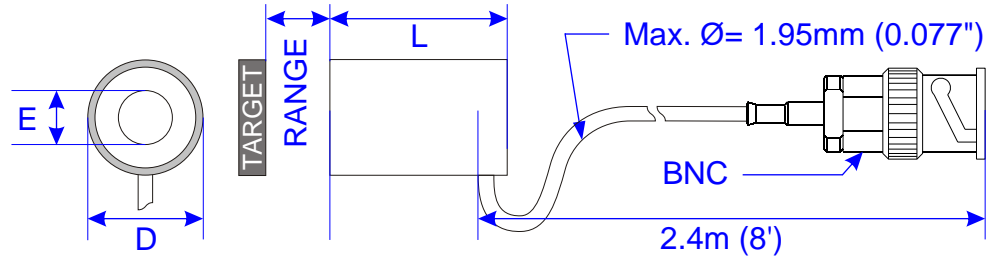
<sup>1</sup> Resolution varies as a function of optional filter bandwidth. Contact MTI Instruments for more details.



# Capacitance Probes

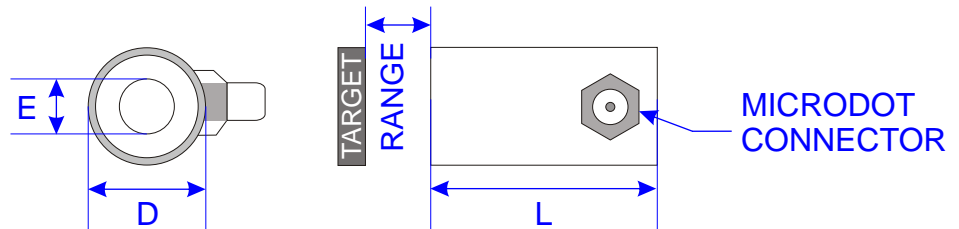
MTII offers wide variety of standard capacitance probes capable of operating with any of the Accumeasure™ family of amplifiers. MTII also manufactures and designs custom capacitive sensors to meet your specific measurement requirements.

**I**NTEGRAL  
**L**EAD  
**R**ADIAL



PRODUCT CODE	Range (FSR)		<sup>2</sup> max range extension	Sensitivity		E		D		L		Min. Range	
	µm	mils		µm/V	mils/V	mm	Inch	mm	Inch	mm	Inch	µm	mils
ASP-1-ILR	25.4	1.0	10	2.54	0.10	1.09	0.043	2.36	0.093	9.53	0.375	1.270	0.050
ASP-2-ILR	50.8	2.0	10	5.08	0.20	1.55	0.061	2.84	0.112	9.53	0.375	2.540	0.100
ASP-5-ILR	127.0	5.0	10	12.70	0.50	2.49	0.098	3.96	0.156	9.53	0.375	6.350	0.250
ASP-10-ILR	254.0	10.0	10	25.40	1.00	3.53	0.139	5.54	0.218	9.53	0.375	12.700	0.500
ASP-20-ILR	508.0	20.0	5	50.80	2.00	5.00	0.197	7.92	0.312	9.53	0.375	25.400	1.000
ASP-50-ILR	1270.0	50.0	3	127.00	5.00	7.98	0.314	13.87	0.546	9.53	0.375	63.500	2.500
ASP-100-ILR	2540.0	100.0	2	254.00	10.00	11.25	0.443	25.40	1.000	9.53	0.375	127.000	5.000
ASP-200-ILR	5080.0	200.0	2	508.00	20.00	15.93	0.627	38.10	1.500	9.53	0.375	254.000	10.000

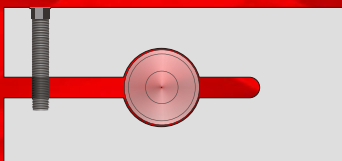
**C**ONNECTOR  
**T**YPE  
**R**ADIAL



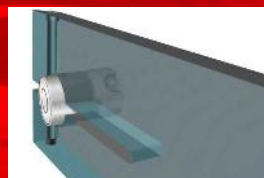
PRODUCT CODE	Range (FSR)		<sup>2</sup> max range extension	Sensitivity		E		D		L		Min. Range	
	µm	mils		µm/V	mils/V	mm	Inch	mm	Inch	mm	Inch	µm	mils
ASP-1-CTR	25.4	1.0	10	2.54	0.10	1.09	0.043	9.53	0.375	25.40	1.000	1.270	0.050
ASP-2-CTR	50.8	2.0	10	5.08	0.20	1.55	0.061	9.53	0.375	25.40	1.000	2.540	0.100
ASP-5-CTR	127.0	5.0	10	12.70	0.50	2.49	0.098	9.53	0.375	25.40	1.000	6.350	0.250
ASP-10-CTR	254.0	10.0	10	25.40	1.00	3.53	0.139	9.53	0.375	25.40	1.000	12.700	0.500
ASP-20-CTR	508.0	20.0	5	50.80	2.00	5.00	0.197	11.13	0.438	25.40	1.000	25.400	1.000
ASP-50-CTR	1270.0	50.0	3	127.00	5.00	7.98	0.314	15.88	0.625	25.40	1.000	63.500	2.500
ASP-100-CTR	2540.0	100.0	2	254.00	10.00	11.25	0.443	25.40	1.000	25.40	1.000	127.000	5.000

<sup>2</sup> Range extensions are performed at the MTI factory by altering the drive circuitry of the associated amplifier card. Range extensions will decrease linearity

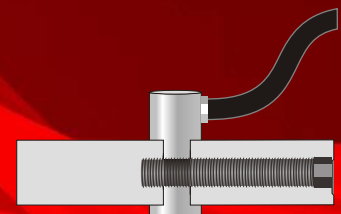
CTR and ILR PROBE MOUNTING: Place Split clamp as close as possible to tip to minimize tip thermal expansion



Bottom View

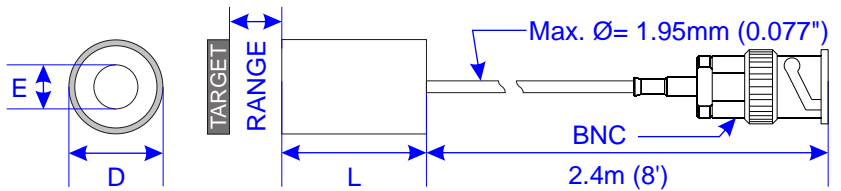


Perspective



Side View

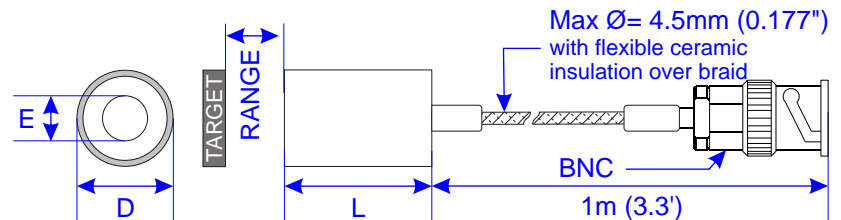
# INTEGRAL LEAD AXIAL



PRODUCT CODE	Range (FSR)		<sup>2</sup> max range extension	Sensitivity		E		D		L		Min. Range	
	µm	mils		µm/V	mils/V	mm	Inch	mm	Inch	mm	Inch	µm	mils
ASP-1-ILA	25.4	1.0	10	2.54	0.10	1.09	0.043	2.36	0.093	9.53	0.375	1.270	0.050
ASP-2-ILA	50.8	2.0	10	5.08	0.20	1.55	0.061	2.84	0.112	9.53	0.375	2.540	0.100
ASP-5-ILA	127.0	5.0	10	12.70	0.50	2.49	0.098	3.96	0.156	9.53	0.375	6.350	0.250
ASP-10-ILA	254.0	10.0	10	25.40	1.00	3.53	0.139	5.54	0.218	9.53	0.375	12.700	0.500
ASP-20-ILA	508.0	20.0	5	50.80	2.00	5.00	0.197	7.92	0.312	9.53	0.375	25.400	1.000
ASP-50-ILA	1270.0	50.0	3	127.00	5.00	7.98	0.314	13.87	0.546	9.53	0.375	63.500	2.500
ASP-100-ILA	2540.0	100.0	2	254.00	10.00	11.25	0.443	25.40	1.000	9.53	0.375	127.000	5.000
ASP-200-ILA	5080.0	200.0	2	508.00	20.00	15.93	0.627	38.10	1.500	9.53	0.375	254.000	10.000

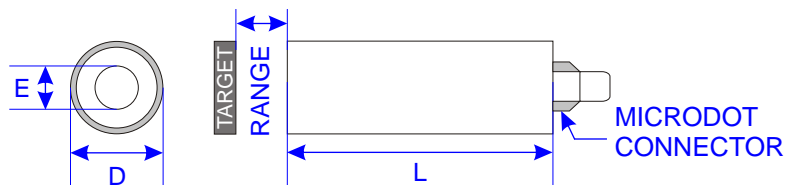
# HIGH TEMPERATURE

Able to withstand 650°C (1200°F).  
The probes are made from Inconel and ceramic high temperature materials.



PRODUCT CODE	Range (FSR)		<sup>2</sup> max range extension	Sensitivity		E		D		L		Min. Range	
	µm	mils		µm/V	mils/V	mm	Inch	mm	Inch	mm	Inch	µm	mils
ASP-10-ILA/HT	254.0	10.0	10	25.40	1.00	3.53	0.139	7.34	0.289	38.10	1.5	12.700	0.500
ASP-20-ILA/HT	508.0	20.0	5	50.80	2.00	5.03	0.198	11.48	0.452	38.10	1.5	25.400	1.000
ASP-50-ILA/HT	1270.0	50.0	3	127.00	5.00	7.98	0.314	16.23	0.639	38.10	1.5	63.500	2.500
ASP-100-ILA/HT	2540.0	100.0	2	254.00	10.00	11.30	0.445	25.37	0.999	38.10	1.5	127.000	5.000
ASP-200-ILA/HT	5080.0	200.0	2	508.00	20.00	16.00	0.630	38.07	1.499	38.10	1.5	254.000	10.000
ASP-500-ILA/HT	12700.0	500.0	1	1270.00	50.00	25.37	0.999	82.52	3.249	38.10	1.5	635.000	25.000

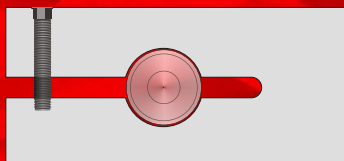
# CONNECTOR TYPE AXIAL



PRODUCT CODE	Range (FSR)		<sup>2</sup> max range extension	Sensitivity		E		D		L		Min. Range	
	µm	mils		µm/V	mils/V	mm	Inch	mm	Inch	mm	Inch	µm	mils
ASP-0.5-CTA	12.7	0.5	20	1.27	0.05	0.74	0.029	6.35	0.250	63.50	2.500	0.635	0.025
ASP-1-CTA	25.4	1.0	10	2.54	0.10	1.09	0.043	6.35	0.250	63.50	2.500	1.270	0.050
ASP-2-CTA	50.8	2.0	10	5.08	0.20	1.55	0.061	6.35	0.250	63.50	2.500	2.540	0.100
ASP-5-CTA	127.0	5.0	10	12.70	0.50	2.49	0.098	6.35	0.250	63.50	2.500	6.350	0.250
ASP-10-CTA	254.0	10.0	10	25.40	1.00	3.53	0.139	6.35	0.250	63.50	2.500	12.700	0.500
ASP-20-CTA	508.0	20.0	5	50.80	2.00	5.00	0.197	11.10	0.437	63.50	2.500	25.400	1.000
ASP-50-CTA	1270.0	50.0	3	127.00	5.00	7.98	0.314	15.88	0.625	63.50	2.500	63.500	2.500
ASP-100-CTA	2540.0	100.0	2	254.00	10.00	11.25	0.443	25.40	1.000	63.50	2.500	127.000	5.000
ASP-200-CTA	5080.0	200.0	2	508.00	20.00	15.93	0.627	38.10	1.500	101.60	4.000	254.000	10.000
ASP-500-CTA	12700.0	500.0	1	1270.00	50.00	25.22	0.993	82.55	3.250	101.60	4.000	635.000	25.000

<sup>2</sup> Range extensions are performed at the MTI factory by altering the drive circuitry of the associated amplifier card. Range extensions will decrease linearity

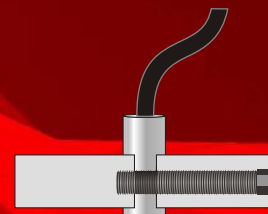
CTA, ILA and HT PROBE MOUNTING: Place Split clamp as close as possible to tip to minimize tip thermal expansion



Bottom View

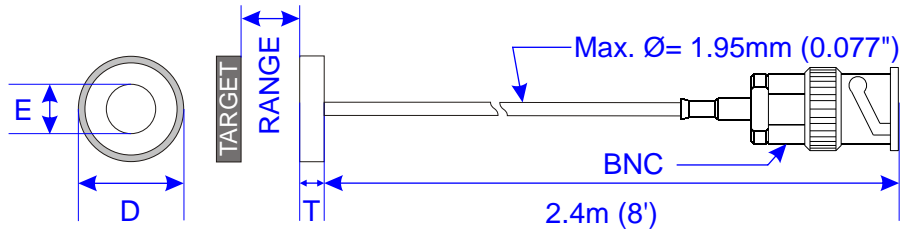


Perspective



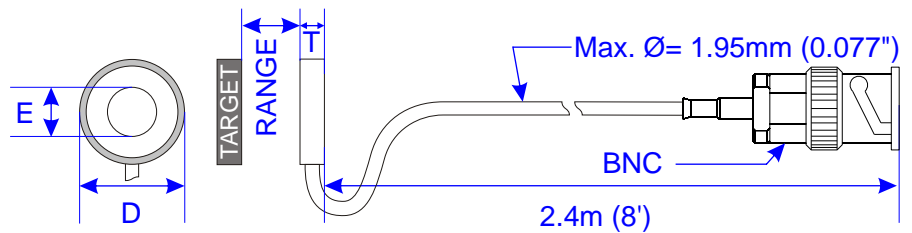
Side View

**P**ANCAKE  
**C**APACITANCE  
**A**XIAL



PRODUCT CODE	Range (FSR)		<sup>2</sup> max range extension	Sensitivity		E		D		T		Min. Range	
	µm	mils		µm/V	mils/V	mm	Inch	mm	Inch	mm	Inch	µm	mils
ASP-1-PCA	25.4	1.0	10	2.54	0.10	1.09	0.043	2.36	0.093	2.54	0.100	1.270	0.050
ASP-2-PCA	50.8	2.0	10	5.08	0.20	1.55	0.061	2.84	0.112	2.54	0.100	2.540	0.100
ASP-5-PCA	127.0	5.0	10	12.70	0.50	2.49	0.098	3.96	0.156	2.54	0.100	6.350	0.250
ASP-10-PCA	254.0	10.0	10	25.40	1.00	3.53	0.139	5.54	0.218	2.54	0.100	12.700	0.500
ASP-20-PCA	508.0	20.0	5	50.80	2.00	4.98	0.196	7.92	0.312	2.54	0.100	25.400	1.000
ASP-50-PCA	1270.0	50.0	3	127.00	5.00	7.98	0.314	13.87	0.546	2.54	0.100	63.500	2.500
ASP-100-PCA	2540.0	100.0	2	254.00	10.00	11.25	0.443	25.40	1.000	2.54	0.100	127.000	5.000
ASP-200-PCA	5080.0	200.0	2	508.00	20.00	15.93	0.627	38.10	1.500	2.54	0.100	254.000	10.000

**P**ANCAKE  
**C**APACITANCE  
**R**ADIAL



PRODUCT CODE	Range (FSR)		<sup>2</sup> max range extension	Sensitivity		E		D		T		Min. Range	
	µm	mils		µm/V	mils/V	mm	Inch	mm	Inch	mm	Inch	µm	mils
ASP-1-PCR	25.4	1.0	10	2.54	0.10	1.09	0.043	2.36	0.093	2.54	0.100	1.270	0.050
ASP-2-PCR	50.8	2.0	10	5.08	0.20	1.55	0.061	2.84	0.112	2.54	0.100	2.540	0.100
ASP-5-PCR	127.0	5.0	10	12.70	0.50	2.49	0.098	3.96	0.156	2.54	0.100	6.350	0.250
ASP-10-PCR	254.0	10.0	10	25.40	1.00	3.53	0.139	5.54	0.218	2.54	0.100	12.700	0.500
ASP-20-PCR	508.0	20.0	5	50.80	2.00	4.98	0.196	7.92	0.312	2.54	0.100	25.400	1.000
ASP-50-PCR	1270.0	50.0	3	127.00	5.00	7.98	0.314	13.87	0.546	2.54	0.100	63.500	2.500
ASP-100-PCR	2540.0	100.0	2	254.00	10.00	11.25	0.443	25.40	1.000	2.54	0.100	127.000	5.000
ASP-200-PCR	5080.0	200.0	2	508.00	20.00	15.93	0.627	38.10	1.500	5.08	0.200	254.000	10.000

<sup>2</sup> Range extensions are performed at the MTI factory by altering the drive circuitry of the associated amplifier card. Range extensions will decrease linearity

## Calibration and Fixturing



FIGURE 1  
FS-2

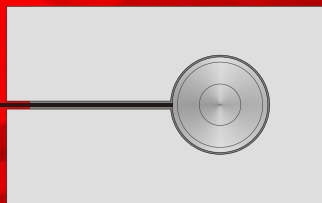
The FS-2 is an adjustable fixture to support and position probes over the target being measured. The system consists of a probe clamp, 2 positioning arms, magnetic base, c-clamp base and a micrometer with a 7mm (0.28") travel. The probe clamp holds probes up to 25.4mm (1.0") in diameter with a reach of approximately 152mm (6").



FIGURE 2  
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.

PCA and PCR PROBE MOUNTING: Often Mounted by Epoxy



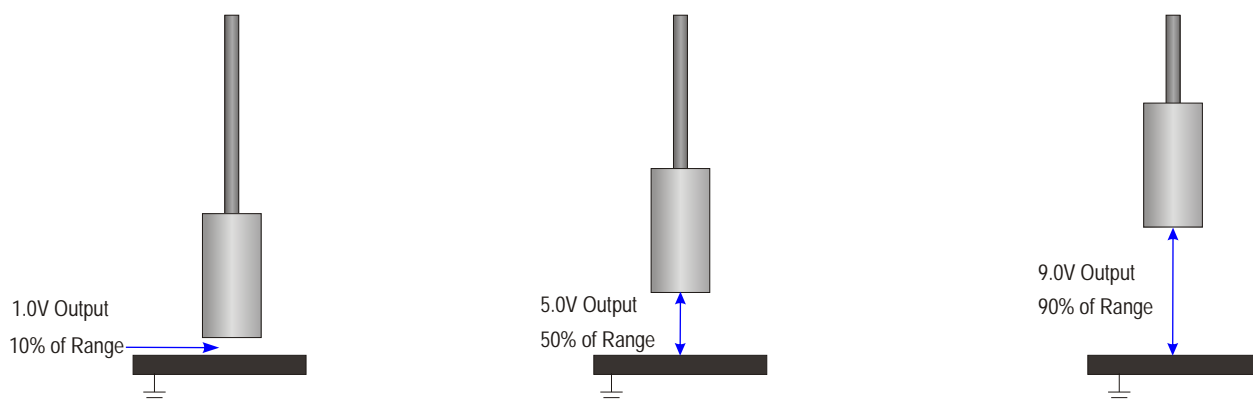
PCR (Top View)



PCA (Side View)

## Probe Recommended Stand-off Ranges

Usable up to 120%\* range



## Optional Accessories

Product #	Product Description	Model Name
<b>7500-3580</b>	<b>Standard Cable for CTA and CTR Probes</b> 2.4 meters (8 feet) length	Microdot-M to BNC-M Cable
<b>7500-6027-05</b>	<b>90 Low Noise Extension Cable</b> 1.2 meters (4 feet) length	BNC-M to BNC-M Extension Cable
<b>7500-6027</b>	2.4meters (8 feet) length	BNC-M to BNC-M Extension Cable
<b>7500-6027-12</b>	3.6 meters (12 feet) length*	BNC-M to BNC-M Extension Cable
<b>2100-2104</b>	<b>BNC Coupler</b> BNC Adapter to join two Extension Cables	BNC-F to BNC-F Adapter
<b>8000-4186</b>	<b>FS-2 Fixture Stand</b>	FS-2 Fixture Stand (FIGURE 1)
<b>8000-4174</b>	<b>Probe Calibrator</b>	KD-CHIIID (FIGURE 2)
<b>2100-1876A</b>	<b>BNC-BNC Bulkhead Feed Thru</b>	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

## Compatible with the following MTI Capacitance Amplifiers



Accumeasure™ 500

Accumeasure™ MicroCap

Accumeasure™ 9000

Accumeasure™ AS-563

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