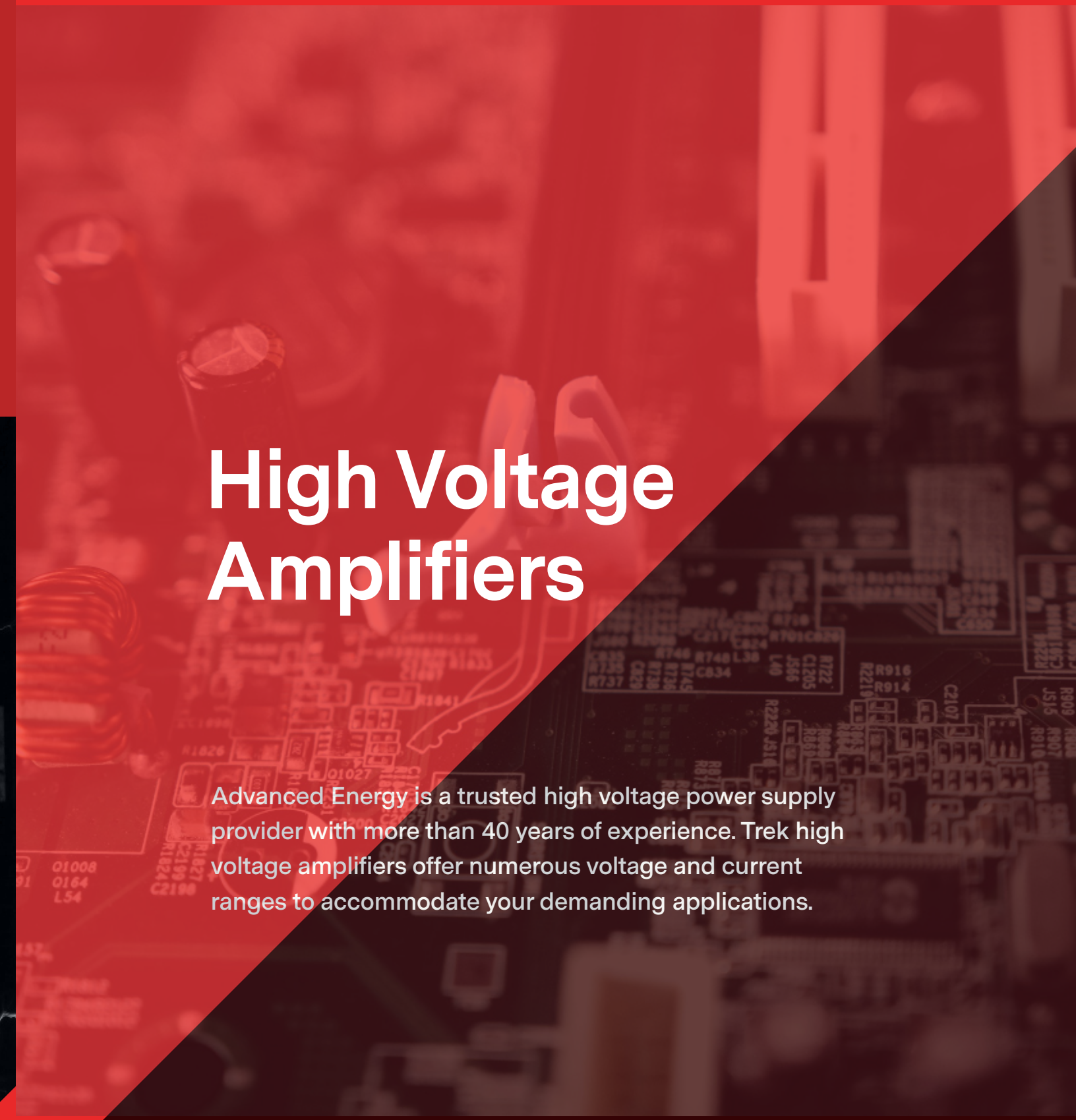
Advanced Energy®

TREK

PRODUCT CATALOG



High Voltage Amplifiers

Advanced Energy is a trusted high voltage power supply provider with more than 40 years of experience. Trek high voltage amplifiers offer numerous voltage and current ranges to accommodate your demanding applications.

High Voltage Amplifiers

Systems Greater than 5 KV					
Amplifier Model	Output Voltage Range (DC or peak AC)	Output Current (DC or peak AC)	Slew Rate (greater than)	Signal Bandwidth (DC to greater than)	Typical Applications
50/12 	0 to ±50 KV	0 to ±12 mA	350 V/µs	Large signal 1.4 kHz (2% distortion) Small signal 20 kHz (-3 dB)	Dielectric studies, electrostatic deflection
40/15 	0 to ±40 KV	0 to ±15 mA	350 V/µs	Large signal 1.4 kHz (2% distortion) Small signal 20 kHz (-3 dB)	Dielectric studies, electrostatic deflection
30/20A 	0 to ±30 KV	0 to ±20 mA	750 V/µs	Large signal 2.5 kHz (2% distortion) Small signal 30 kHz (-3 dB)	Electrostatic deflection
20/20C-HS 	0 to ±20 KV	0 to ±20 mA ±60 mA peak AC for 1 ms must not exceed 20 mA rms	800 V/µs	Large signal 5.2 kHz (1% distortion) Small signal 20 kHz (-3 dB)	Dielectric studies, electrostatic deflection
10/40A-HS 	0 to ±10 KV	0 to ±40 mA ±120 mA peak AC for 1 ms must not exceed 40 mA rms	900 V/µs	Large signal 23 kHz (-3 dB), 9 kHz (1% distortion) Small signal 25 kHz (-3 dB)	Atomspheric plasma, dielectric barrier discharge, mass spectrometers
10/10B-HS 	0 to ±10 KV	0 to ±10 mA DC ±40 mA peak AC for 1 ms	700 V/µs	Large signal 19.5 kHz (-3 dB), 9.5 kHz (1% distortion) Small signal 60 kHz (-3 dB)	Atomspheric plasma, dielectric barrier discharge, mass spectrometers

High Voltage Amplifiers

Systems Greater than 5 KV (Con't)					
Amplifier Model	**Output Voltage Range (DC or peak AC)**	**Output Current (DC or peak AC)**	**Slew Rate (greater than)**	**Signal Bandwidth (DC to greater than)**	**Typical Applications**
610E 	0 to ±1 KV or 0 to ±10 KV	0 to ±200 µA or 0 to ±2000 µA	20 V/µs	Large signal 1.2 kHz (-3 dB), 600 Hz (1% distortion) Small signal 10 kHz (-3 dB)	R&D, electrophotography

Systems Up to 5 KV					
Amplifier Model	**Output Voltage Range (DC or peak AC)**	**Output Current (DC or peak AC)**	**Slew Rate (greater than)**	**Signal Bandwidth (DC to greater than)**	**Typical Applications**
5/80-HS 	0 to ±5 KV	0 to ±80 mA	1200 V/µs	Large signal 35 kHz, 50 kHz (1% distortion) Small signal 100 kHz (-3 dB)	Polymer & ceramic corona charging, plasma chemistry
609E-6 	0 to ±4 KV	0 to ±20 mA	150 V/µs	Large signal 13 kHz (-3 dB), 6 kHz (1% distortion) Small signal 35 kHz (-3 dB)	AC & DC biasing, electrorheological fluids
623B 	0 to ±2 KV	0 to ±40 mA	300 V/µs	Large signal 10 kHz (1% distortion) Small signal 40 kHz (-3 dB)	Electrostatic beam deflection, piezoelectric driving/polling
PZD700A-1 (1-channel) **PZD700A-2 (2-channel)** 	0 to ±700 V (bipolar)	0 to ±100 mA (bipolar)	380 V/µs (bipolar)	Large signal 125 kHz (-3 dB) (bipolar) Small signal 200 kHz (-3 dB)	Semiconductor reserach, piezoelectric driving
2220 	0 to ±2 KV	0 to ±10 mA DC ±40 mA peak AC for 5 ms	100 V/µs	Large signal 7.5 kHz (-3 dB) Small signal 50 kHz (-3 dB)	Piezoelectric driving, electrophoresis research
2210 	0 to ±1 KV	0 to ±20 mA DC ±40 mA peak AC for 5 ms	150 V/µs	Large signal 40 kHz (-3 dB) Small signal 100 kHz (-3 dB)	Piezoelectric driving
2205 	0 to ±500 V	0 to ±40 mA DC ±80 mA peak AC for 5 ms	150 V/µs	Large signal 75 kHz (-3 dB) Small signal 100 kHz (-3 dB)	Piezoelectric driving

High Voltage Amplifiers

Systems Up to 5 KV (Con't)					
Amplifier Model	Output Voltage Range (DC or peak AC)	Output Current (DC or peak AC)	Slew Rate (greater than)	Signal Bandwidth (DC to greater than)	Typical Applications
601C-1 (1-channel) 	0 to ±500 V 0 to +1 KV 0 to -1 KV	0 to ±10 mA DC, ±20 mA peak AC	50 V/µs	Large signal 8 kHz (1% distortion) Small signal 30 kHz (-3 dB)	Modulating electro-optics, piezoelectric driving
2100HF 	0 to ±150 V	0 to ±300 mA	2000 V/µs (typical)	Large signal 2.6 MHz (-3 dB) Small signal 3 MHz (-3 dB)	Piezoelectric driving, MEMS, electro-optics modulation, ultrasonics, dielectric material characterization

E-Chuck Power Supply				
Model	Output Voltage Range (DC or peak AC)	Output Current (DC or peak AC)	Special Features	Typical Applications
645-HT 	0 to ±1 KV	0 to ±20 mA DC or peak AC	Software driven, amplifier-powered, wafer detection	Electrostatic bipolar semiconductor wafer chucking (E-chuck) system
645 	0 to ±2 KV	0 to ±6.5 mA DC ±10 mA peak	Software driven, amplifier-powered, wafer detection	Electrostatic bipolar semiconductor wafer chucking (E-chuck) system
646 	0 to ±3 KV	0 to ±6.5 mA DC ±10 mA peak	Software driven, amplifier-powered, wafer detection	Electrostatic-driven clamping, holding, chucking of material

Electrostatic Voltmeters

Advanced Energy's Trek and Monroe electrostatic voltmeters allow you to accurately measure surface potential (voltage) on materials. Choose from contacting and non-contacting voltmeters and on-board controllers. Various probe options are also available.

Electrostatic Voltmeters

Non-contacting

Trek 323 High-Sensitivity DC Stable Electrostatic Voltmeter

Features and Specifications

- Measurement range 0 to ±100 VDC or peak AC
- Drift spacing/null adjustment
- Speed of response less than 300 ms for a 100 V step
- 5 mV sensitivity
- Additional probes available

Applications

- Semiconductor wafer surface voltage measurement
- Surface work function measurement
- Disk drive charge accumulation measurements

Trek 325 High-Sensitivity/Low-Noise Electrostatic Voltmeter

Features and Specifications

- Measurement range 0 to ±40 VDC or peak AC
- Measurement accuracy better than 0.05% of full scale
- Speed of response less than 5 ms for a 40 V step
- 1 mV sensitivity
- Response speed control

Applications

- Semiconductor wafer surface voltage measurement
- Contact potential measurements
- Material evaluation
- Electret studies

Trek 341B High-Voltage DC-Stable Electrostatic Voltmeter

Features and Specifications

- Measurement range 0 to ±20 KVDC or peak AC
- Measurement accuracy better than 0.1% of full scale
- Speed of response less than 200 µs for a 1 KV step
- Easy-to-read LED display

Applications

- Electrophotographic research and development
- Charge accumulation monitoring of LCD
- Monitoring surface potentials in electrostatic painting processes
- Measuring electrostatic potential on polymers, rubber, fabrics and paper

Trek 347 Economical Electrostatic Voltmeter

Features and Specifications

- Measurement range 0 to ±3 KVDC or peak AC
- Measurement accuracy ±0.05%
- Speed of response less than 300 ms for a 1 KV step
- Superb noise and drift performance
- Precision voltage monitor output

Applications

- Photoconductor or dielectric surface voltage measurements
- Charge accumulation monitoring in semiconductor production
- Electrostatic potential measurement on film, polymers and paper

Electrostatic Voltmeters

Non-contacting

Trek 370 Higd Electrostatic Voltmeter

Features and Specifications

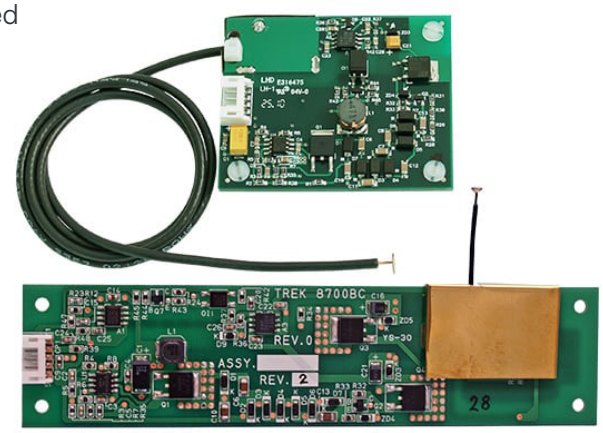
- Measurement range 0 to ±3 KVDC or peak AC
- Measurement accuracy 0.05%
- Speed of response less than 50 µs for a 1 KV step
- Automatic Gain Control
- Digital Enable to enable or disable the measurement remotely

Applications

- Electrophotographic research and development
- Research and development of photoreceptors
- Charge accumulation monitoring of semiconductor production processes
- Radiation effect studies

Trek On-Board Controllers High Speed, Low-Cost OBCs for ESVM and ESD Applications

Trek On-Board Controllers (OBCs) offer non-contact voltage measurement by using a chopper-stablized, field-nulling technique that maintains DC stability and high accuracy over wide probe-to-surface variations. This technique assures no voltage loading and permits accurate measurements without the need to establish fixed probe spacing.



Features and Specifications

- Measurement range 0 to ±1.2 KVDC or peak AC
- Measurement accuracy better than ±1%
- Speed of response less than 5 ms for a 1 KV step
- Customer-specified voltage monitor output ratios
- Probe-to-surface separation spacing independence
- Customer-specified OBC size
- Custom designs for probe mounting fixtures
- Spatial Resolutions to less than 8 mm

Non-Contacting Electrostatic Probe Selection Chart

The patented design of Advanced Energy's Trek probes provides the largest possible signal strength to reduce noise and drift, and to maintain performance at wider probe-to-surface distances. Selection considerations:

- Aperture Size
- High Temperature
- Special Purpose
- Miniature
- End and Side View
- High Resolution
- High Sensitivity
- Round and Square Bodied
- Transparent
- High Vacuum

Trek Electrostatic Probe Options						
Electrostatic Voltmeter Model	**Probe Model**	**Dimensions (H x W x L) or (dia x L)**	**Body Shape / Aperture Location / Aperture Size**	**Special Feature**	**Speed of Response (Less Than)**	**Noise (rms) (Less Than)**
Trek 320C 0 to ±100 V DC or peak AC						
	3250	30.5 x 28.7 x 57.2 mm	Square / side / 6.35 mm dia	High sensitivity	300 ms	5 mV (1:1 ratio)
Trek 323 0 to ±100 V DC or peak AC						
	6000B-8	9.5 dia x 68.6 mm	Round / side/ 1.33 mm dia	High sensitivity	300 ms	20 mV (1:1 ratio)
	6000B-16	10 .2 sq x 68.6 mm	Square / side / 1.32 mm dia	High sensitivity	300 ms	20 mV (1:1 ratio)
Trek 325 0 to ±40 V DC or peak AC						
	PD1216P	10 dia. x 56 mm	Round / side / 4.6 mm dia	High sensitivity	3 ms	1 mV (1:1 ratio)
Trek 341B 0 to ±20 KV DC or peak AC and Trek P0865 0 to ±100 V DC or peak AC						
	3450	11.8 x 11.1 x 76.2 mm	Square / side / 3.05 X 1.52 mm		200 µs	20 mV
	3453ST	11.8 x 11.1 x 76.0 mm	Square / side / 1.59 mm dia	High temperature (to 100°C) High vacuum		
	3455ET	11.8 x 11.1 x 76.2 mm	Square / end / 1.59 mm dia			
Trek 344 0 to ±2 KV DC or peak AC and Trek 347 0 to ±3 V DC or peak AC						
	555P-1	5.6 sq x 49.8 mm	Square / side / 2.56 mm dia	Miniature	3 ms	3 mV
	555P-2 555P-4	5.6 sq x 49.8 mm	Square / end / 1.17 mm dia	Miniature	4.5 ms	4 mV
	6000B-5C	11.2 dia x 69.7 mm	Round / end / 0.79 mm dia	High Resolution	4.5 ms	4 mV
	6000B-6	10.3 dia x 69.7 mm	High sensitivity	High Resolution	3 ms	3 mV
	6000B-7C	11.2 dia x 65.7 mm	Round / end / 1.32 mm dia		4.5 ms	4 mV
	6000B-8	9.5 dia x 68.6 mm	Round / side / 1.32 mm dia		3 ms	2 mV

Non-Contacting Electrostatic Probe Selection Chart

The patented design of Advanced Energy's Trek probes provides the largest possible signal strength to reduce noise and drift, and to maintain performance at wider probe-to-surface distances. Selection considerations:

- Aperture Size
- High Temperature
- Special Purpose
- Miniature
- End and Side View
- High Resolution
- High Sensitivity
- Round and Square Bodied
- Transparent
- High Vacuum

Trek Electrostatic Probe Options (Con't)

Electrostatic Voltmeter Model	Probe Model	Dimensions (H x W x L) or (dia x L)	Body Shape / Aperture Location / Aperture Size	Special Feature	Speed of Response	Noise
Trek 370 0 to ±3000 V DC or peak AC						
Trek 370 0 to ±3000 V DC or peak AC	3800AE-2-3M	5.6 sq x 50 mm	Square / end / 1.85 mm dia	Miniature	Model 370 is less than 50 µs	Model 370 is less than 20 mV
	3800S-2	5.6 sq x 50 mm	Square / side / 2.35 mm dia	Miniature		
	3870AET-2	5.6 mm H x 5.6 mm W x 50.0 mm L	Square / end / 1.85 mm dia	High-speed		
	3870ST-2	5.6 mm H x 5.6 mm W x 50.0 mm L	Square / side / 2.35 mm dia	High-speed		
	7000ER	8.7 sq x 69.8 mm	Round / end / 1.6 mm dia			

ESD Instrumentation

Our electrostatic discharge (ESD) measurement and control solutions include charge plate monitors, sensors, resistivity meters, fieldmeters, and voltmeters. Reliably monitor, measure, and locate electric charge, surface voltage, and resistivity.

Charge Plate Monitors

Non-contacting

Trek 156A Charge Plate Monitor for Evaluating the Performance of Air Ionizers Used to Neutralize Static Charges

Features and Specifications

- Measurement range 0 to ±1100 VDC or peak AC
- Measurement accuracy ±0.1% (Full Scale)
- Large Signal Bandwidth 10 Hz
- Compliance to IEC 61340 5-1
- Mode of operation is easy to select via three-position toggle switch
- Can accept a variety of ion collection plate sizes
- kits are available which include the CPM, a 6”x 6” ion collecting plate, and a carrying case.

Applications

- ESD monitoring in semiconductor, disk drive and LCD
- Testing of all types of ionizers, including room ionization systems, AC and DC blowers, nuclear ionizers
- ESD measurement of de-ionized water

* Please specify plate type(s) when ordering Model 156A

Trek 157 Charged Plate Monitor That Offers Better Accuracy, Stability, and Bandwidth Than Conventional Designs

Features and Specifications

- Measurement range 0 to ±1020 VDC or peak AC
- Measurement accuracy ±0.1% (Full Scale)
- Large Signal Bandwidth 80 Hz (-3dB)
- Compliance to IEC 61340 5-1
- Store & retrieve data as data points or graphs; internal memory
- USB connection (to PC) enables real time data
- Can accept a variety of ion collection plate sizes
- kits are available which include the CPM, a 6”x 6” ion collecting plate, and a carrying case.

Applications

- ESD monitoring in semiconductor, disk drive and LCD
- Testing of all types of ionizers, including room ionization systems, AC and DC blowers, nuclear ionizers
- ESD measurement of de-ionized water

* Please specify plate type(s) when ordering Model 157

Trek 158A Compact Charged Plate Monitor for Evaluating Air Ionization System Performance

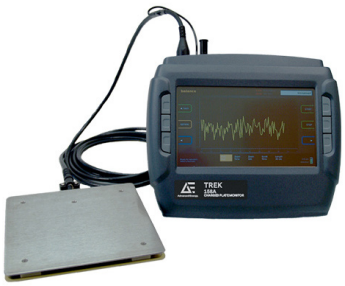
Features and Specifications

- Measurement range 0 to ±1100 VDC or peak AC
- Measurement accuracy ±0.1% (Full Scale)
- Large Signal Bandwidth 80 Hz (-3dB)
- User-friendly compact design with superior data collection and storage capability
- 0.1 V plate voltage resolution
- Compliance to IEC 61340-5-1 and ANSI/ESD STM3.1
- Use the PC memory card port for ample data storage and easy data transfer
- Can accept a variety of ion collection plate sizes
- kits are available which include the CPM, a 6”x 6” ion collecting plate, and a carrying case.

Applications

- Performance evaluation of air ionization systems
- Material Dissipation Testing
- Site Specific Contacting Voltage Measurement
- Voltage measurement of floor materials and footwear in combination with a person (ANSI ESD STM97.2 and IEC 61340-4-5)

* Please specify plate type(s) when ordering Model 158A



Charge Plate Monitors

Non-contacting

Monroe 287B Portable Alternative to Charged Plate Monitors for Periodic Verification of Ionizer Performance

Features and Specifications

- Measurement range 0 to ±1250 V
- Charge Plate Size 43 x 102 mm (1.7 x 4 in)
- Intergrates decay timer lacking in ionizer test kits for fieldmeters
- Exceeds current requirements of ANSI/ESD SP3.3 for Periodic Verification of Air Ionizers
- Built-in self-test include battery check and tests for functional errors
- Optional 6-inch plate attachment (Model 287/22C) achieves 1:1 correspondence with standard charged-plate monitor test results
- Low cost / performance ratio
- Hand held, battery operated

Monroe 288C Easy-to-Use Charge Plate Monitor For Manual or Automated Testing

Features and Specifications

- Measurement range 0 to ±1200 V
- Charge Plate Size 15 x 15 cm (6 x 6 in)
- Speed of Response less than 10 ms
- USB Communications Interface
- Internal battery for portable operation
- Detachable 6 x 6-inch plate with optional 1 x 1 in and 3 x 3 in plates
- Built-in temperature and humidity sensors
- Auto-ranging to 0.1 V resolution below 100 V Meets ESD Association Standard ANSI / ESD STM 3.1
- Perform manual and automated testing of decay and balance
- Use the large, easy-to-read, high contrast LCD display

High Performance Fieldmeters and Voltmeters

Advanced Energy boasts high-performance fieldmeters and voltmeters that are designed to provide accurate and reliable measurements in a variety of applications.

High Performance Fieldmeters and Voltmeters

Trek 541A DC Feedback Non-Contacting Electrostatic Voltmeter for EOS and ESD Processes

Features and Specifications

- Measurement range 0 to ±1KV (Model 541A-2: 0 to ±100V)
- Accuracy better than ±1% of full scale over a probe-to-surface separation of 2.5 mm ± 1 mm
- USB or RS-232 serial port enables computer-based control & monitoring
- Visual and audible alarms Ionizers
- LCD screen displays present voltage and offers peak data hold function
- Very small probe-to-test surface distances, excellent spot resolution and accuracy
- Chopper probe is DC stable with/ without incident air ion flow
- Optional walking test adapter kits available

Trek 542A AC Feedback Non-Contacting Electrostatic Voltmeter for EOS and ESD Processes

Features and Specifications

- Measurement range 0 to ±10KV (Model 542A-2: 0 to ±20KV)
- Accuracy better than ±5% of the reading ±0.2% of full scale over a probe-to-surface separation of: Trek 542A-1: 15 to 30 mm; Trek 542A-2: 30 to 60 mm
- USB or RS-232 serial port enables computer-based control & monitoring
- Visual and audible alarms Ionizers
- LCD screen displays present voltage and offers peak data hold function
- Chopper probe is DC stable with/ without incident air ion flow
- Optional walking test adapter kits available

Portable Fieldmeters and Voltmeters

Advanced Energy's Monroe and Trek fieldmeters and voltmeters offer a feedback-driven design that ensures accurate, drift-free, non-contact measurements of electrostatic field strength and voltage. They're easy to use and designed to fit seamlessly into various applications. Whether it's monitoring charge build-up on webs during lamination, coating, printing, or being utilized in manufacturing processes, electronic assembly testing, and semiconductor material testing, these fieldmeters provide robust solutions. They're also excellent tools for ESD auditing, static monitoring, and IC handlers, making them versatile additions to any operation.

Portable Fieldmeters and Voltmeters

Monroe 282IS Non-contacting Static Meters for Consistently Accurate Readings

Features and Specifications

- Normal Range 0 to ±19.99 KV @ 1 in
- Accuracy ±5% of reading, + zero offset, ±LSD
- Response Time 80 to 100 msec, 10 to 90%
- LED pulsed beam range finder identifies calibrated distance from the surface
- Exclusive Auto-Zero circuit
- Chopper-stabilized measurement technique works in the presence of ionization
- Drift-free accuracy even in ionized environments
- Monitoring "static-free" electronic workstations
- UL recognized as intrinsically safe for use in volatile environments

Trek 520 Series Hand-Held Electrostatic Voltmeters for ESD Applications

Features and Specifications

- Trek 520: 0 to ±2 KVDC

Trek 523: 0 to ±20 KVDC

- Better than ±5% Accuracy
- Speed of Response: Trek 520: Less than 25 ms for a 0 to ±2 KV input step change
- Chopper stabilized for drift-free operation in ionized environments
- NIST-traceable Certificate of Calibration provided with each unit
- Accurately measure surface voltage at a wide range of spacings
- No need to maintain a fixed spacing

Trek 876 and 884 Series Non-Contacting, Hand-Held Electrostatic Voltmeters

Features and Specifications

- Trek 876: 0 to ±2 KVDC
- Trek 884: 0 to ±20 KVDC
- Better than ±5% Accuracy
- Chopper stabilized for drift-free operation in ionized environments
- NIST-traceable calibration certificate provided with each unit
- Features 3.5-digit, liquid crystal display
- Accurately measure surface voltages
- No need to maintain fixed spacing
- Use in ionized or non-ionized environments

Resistance Meter

Trek 152-1 Series Surface Resistance / Volume Resistance Meter

Features and Specifications

- Measurement Range 10^{3} to 10^{13} Ω
- Test Voltage Select 10V or 100V (±2%)
- Accuracy, stability and repeatability in a lightweight, portable design
- Complies with IEC 61340-2-3 for Volume Resistance Measurements
- Technique used to measure surface resistance and volume resistance conforms to ANSI/ESD Association standards (STM2.1, 4.1, 7.1, 9.1, 11.11, 11.12, 12.1, 11.13, 97.1)
- Variety of probes available

Trek 152-1 Series Test Probes

- Model 152BP-5P Test Probes Set of 2 (2.27 kg / 5 lb). Available for performing resistance measurements including ANSI/ESD STM 4.1 standards (point-to-point or resistance to ground measurement)
- Model 152P-2P Two-Point Resistance Probe Performs measurements on surface areas too small to be measured with conventional probes
- Model 152P-CR-1 Surface/Volume Concentric Ring Probe* Measures surface and volume resistance of materials as per IEC or ESDA standards. A three (3) position switch on the probe selects either SURFACE distance or VOLUME resistance measurements with either a GUARDED or UNGUARDED outer electrode. Uses an exclusive built-in pre-amplifier design.

152BP-5P
Point-to-point Probes

152P-2P
Two-Point Probe

152P-CR-1
Concentric Ring Probe

ABOUT ADVANCED ENERGY

Since 1981, Advanced Energy (AE) — and its UltraVolt® and Trek® product families — have perfected how power performs for its customers. For both end users and OEMs, AE's comprehensive portfolio of standard and custom high voltage components precisely match system specifications to deliver unparalleled energy, quality, and performance. Through close customer collaboration, design expertise, application insight, and world-class support, AE creates successful partnerships and enables customers to push the boundaries of innovation and stay ahead of evolving market needs.

PRECISION | POWER | PERFORMANCE | TRUST

CAUTION:
High Voltage

Read and understand all documentation before you install, operate, or maintain Advanced Energy high voltage power supplies. Follow all safety instructions and precautions to protect against property damage and serious or possibly fatal bodily injury. Never defeat safety interlocks or grounds.

Advanced Energy

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