# Trek ESD Measurement & Control Instruments - Table of Contents

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*Note: Trek products are not rated for use in an explosive atmosphere*
Model 520-1, Model 876
AC Feedback Electrostatic Voltmeters

Features
- Non-contacting voltage measurement
- No need to maintain fixed spacing; accurate at a wide range of spacings
- Portable (battery operated)
- Good for difficult-to-reach locations (Model 876 has probe-on-cable design)
- Drift-free operation in ionized environments
- Low cost

Applications

Specifications
Measurement Range ......................................................... 0 to ±2kV
Voltage Display .......................................................... 0 to ±1999V
Voltage Resolution ......................................................... 1V
Probe-to-Surface Separation .......................... Range of 5 to 25mm
Accuracy .............................................................. ±5% (Full Scale)
Speed of Response ...................................................... 400ms
Operating Conditions
  Temperature .................................................. 15 to 35°C
  Relative Humidity ........................................ 85%RH, noncondensing
Power Supply ......................................................... 9V alkaline battery (1)
Dimensions .......... 5.9cm W x 3.1cm H x 14.6cm L (without cable sensor)
Weight ......................................................... 185g

Model 520-1

Model 876

Model 520-2 (with analog output function)
Output Ratio .......................................................... 1/1000 of the measured voltage
Speed of Response ...................................................... 25ms
Output Terminal ......................................................... 1.3mm jack

C (CE compliant)*

Model 523-1, Model 884
AC Feedback Electrostatic Voltmeters

Features
- Non-contacting voltage measurement
- No need to maintain fixed spacing; accurate at a wide range of spacings
- Portable (battery operated)
- Good for difficult-to-reach locations (Model 884 has probe-on-cable design)
- Drift-free operation in ionized environments
- Low cost

Applications

Specifications
Measurement Range ......................................................... 0 to ±20kV
Voltage Display .......................................................... 0 to ±19.99kV
Voltage Resolution ......................................................... 10V
Probe-to-Surface Separation .......................... Range of 30 to 60mm
Accuracy .............................................................. ±5% (Full Scale)
Speed of Response ...................................................... 400ms
Operating Conditions
  Temperature .................................................. 15 to 35°C
  Relative Humidity ........................................ 85%RH, noncondensing
Power Supply ......................................................... 9V alkaline battery (1)
Dimensions .......... 5.9cm W x 3.1cm H x 14.6cm L (without cable sensor)
Weight ......................................................... 200g

C (CE compliant)*

Model 523-1

Model 884
Model 541A-1  DC Feedback Electrostatic Voltmeter - USB Supported

Features
- USB or RS-232 serial port enables computer-based control & monitoring
- Visual and audible alarms
- 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

Applications
Static charge measurement of semiconductor devices. Monitor electrostatic levels in IC production processes, semiconductor production processes and various production lines.

Specifications
Measurement Range ....................... 0 to ±1kV (Model 541A-2: 0 to ±100V)
Output Monitor
  Output Voltage ........................................... 0 to ±10V (1/100)
  Output Current ...................................................... 4 to 20mA
Probe-to-Surface Separation......................... Range of 1 to 10mm
Accuracy ......................................................... ±1% (Full Scale) or better
Speed of Response ........................................ 50ms for 1kV step (10 to 90%)
Operating Conditions
  Temperature ................................................... 15 to 35°C
  Relative Humidity ........................................ 5 to 85%RH, noncondensing
Power Supply ................................................... Line to 15V DC adapter
Dimensions ............................................... 15.2cm W x 10.2cm H x 21.6cm D
Weight .......................................................... 770g

Please specify probe type(s) when ordering Model 541A-1 or 541A-2.

Probes for Model 541A ................................. Model 541PR-S (side view)
  Model 541PR-E (end view)
  Model 541P-S (side view)
Vacuum application probes also available
Walking Test Adapter ...... For analysis of charge levels on the human body
Compliant with ANSI/ESD STM97.2; IEC 61340-4-5

(CE compliant)*

Model 542A-1  AC Feedback Electrostatic Voltmeter - USB Supported

Features
- USB or RS-232 serial port enables computer-based control & monitoring
- Visual and audible alarms
- LCD screen displays present voltage and offers peak data hold function
- Drift-free measurements
- Chopper probe is DC stable with/without incident air ion flow
- Voltage output monitor for remote monitoring or control

Applications
Static charge measurement of plastic and polymer film. Monitor electrostatic levels in LCD production processes and for various production lines.

Specifications
Measurement Range ....................... 0 to ±10kV (Model 542A-2: 0 to ±20kV)
Output Monitor
  Output Voltage ........................................... 0 to ±10V (1/1000); Model 542A-2: (1/2000)
  Output Current ...................................................... 4 to 20mA
Probe-to-Surface Separation ...................... Range of 15 to 30mm
  (Model 542A-2: 30 to 60mm)
Accuracy ......................................................... ±5% (of Reading); ±0.2% (Full Scale)
Speed of Response ........................................ 50ms for 1kV step (10 to 90%)
Operating Conditions
  Temperature ................................................... 15 to 35°C
  Relative Humidity ........................................ 5 to 85%RH, noncondensing
Power Supply ................................................... Line to 15V DC adapter
Dimensions ............................................... 15.2cm W x 10.2cm H x 21.6cm D
Weight .......................................................... 770g

Please specify probe type(s) when ordering Model 542A-1 or 542A-2.

Probes for Model 542A ................................. Model 542P-S (side view)
  Model 542P-45D (45 degree angle)
Vacuum application probes also available
Walking Test Adapter ...... For analysis of charge levels on the human body
In support of EN 1815; Assessment of Static Electrical Propensity on Resilient and Textile Floor Coverings

(CE compliant)*
Model 541A, 542A Application Software

Explanation of the Screen
1. Voltage display (V) ........................................... Display measured voltage
2. Positive (+) threshold (V) .................................................. Set the level
3. Negative (-) threshold (V) .................................................. Set the level
4. Positive (+) peak value (V) ............... Display maximum voltage value of positive (+) side
5. Negative (-) peak value (V) ............... Display maximum voltage value of negative (-) side
6. Menu screen .............................................. Display the screen setting of the measurement
7. Data save .................................................. Save measurement value
8. Reset .................................................. Reset the peak value
9. Exit .................................................. Terminate the software
10. Length of time ......................... Select the length of time for displaying the measurement value (storage time)

To enhance the utility of Model 541A and Model 542A, Trek provides application software (available for download at www.trekinc.com) and a USB or RS-232 serial port on both models for interfacing with a Windows® PC. Trek’s software thereby enables touchscreen setting of threshold values and preservation of data. The data can be viewed graphically (screen shot above), in real time. Other PC-friendly adjustments include threshold setting, alarm ON/OFF, and storage time.

Model 821HH Infinitron® Hand-Held Contacting Electrostatic Voltmeter

Features
• Portable, battery-operated, compact design
• Trek contacting technology enables precise surface voltage measurements
• Measure conductive and insulative objects/surfaces with virtually zero charge transfer to the measurement probe
• Save test data to internal memory
• Data graphing capabilities (via connection with PC)

Specifications
Input Characteristics............... Resistance >10¹⁴, Capacitance <10⁻¹⁴F Measurement Range................................. 0 to ±2kV DC or peak AC Bandwidth ................................................................. 1kHz (-3dB) Accuracy .................................................. ±1% (Full Scale) Operating Conditions
Temperature .............................. 15 to 35°C Relative Humidity ......................... 5 to 75%RH, noncondensing Power Supply ................................. Internal NiMH battery (approx. 8 hours continuous usage from a full charge) or external 15V @ 1A supply/charger for line operation Dimensions ..................................... 14.0cm W x 24.0cm H x 5.25cm D Weight ................................................................. 1.13kg (includes battery)

CE (CE compliant)*
**Model 156A** Charged Plate Monitor

**Features**
- Compliance to IEC 61340-5-1 and ANSI/ESD STM3.1
- Mode of operation is easy to select via three-position toggle switch
- Standard ion collection plate, 6" x 6"

**Specifications**

<table>
<thead>
<tr>
<th>Measurement Range</th>
<th>0 to ±1100V DC or peak AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Signal Bandwidth</td>
<td>1kHz (-3dB)</td>
</tr>
<tr>
<td>Output Monitor</td>
<td>1/200 of the plate voltage</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.1% (Full Scale)</td>
</tr>
<tr>
<td>Offset Voltage</td>
<td>±10mV</td>
</tr>
<tr>
<td>Output Noise</td>
<td>10mV rms</td>
</tr>
</tbody>
</table>

**Operating Conditions**
- Temperature: 5 to 35°C
- Relative Humidity: to 80%RH, noncondensing

**Power Supply**
- Built-in rechargeable battery (approx. 8 hours of continuous usage from a full charge) or by using a recharge/operating AC adapter. AC power adapter for all global areas is available.

**Dimensions**
- 31.8cm W x 8.3cm H x 28.0cm D
**Weight**
- 2.0kg

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**Model 157** Charged Plate Monitor

**Features**
- Compliance to IEC 61340-5-1 and ANSI/ESD STM3.1
- Store & retrieve data as data points or graphs; internal memory
- USB connection (to PC) enables real-time data
- Connect to the optional Thermodrysometer Kit (Omega Model HH331)
- Bar code wand also available

**Specifications**

<table>
<thead>
<tr>
<th>Measurement Range</th>
<th>0 to ±1020V DC or peak AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Signal Bandwidth</td>
<td>80Hz (-3dB)</td>
</tr>
<tr>
<td>Monitor Output</td>
<td>1/200 of the plate voltage</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.1% (Full Scale)</td>
</tr>
<tr>
<td>Offset Voltage</td>
<td>±10mV</td>
</tr>
<tr>
<td>Output Noise</td>
<td>10mV rms</td>
</tr>
</tbody>
</table>

**Operating Conditions**
- Temperature: 5 to 35°C
- Relative Humidity: to 80%RH, noncondensing

**Power Supply**
- Built-in rechargeable battery (approx. 8 hours of continuous usage from a full charge) or by using a recharge/operating AC adapter. AC power adapter for all global areas is available.

**Dimensions**
- 25.4cm W x 10.2cm H x 24.1cm D
**Weight**
- 2.0kg

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**Ion Collecting Plates** *(can be used with Model 156A and 157)*

- Standard Charged Plate, 15cm x 15cm (6" x 6") - Model 156AP C150x150-R5M**;
- Standard Charged Plate, 25mm x 25mm (1" x 1") - Model 156P C25x25-S3M;
- High Temperature Charged Plate, 15cm x 15cm (6" x 6") - Model 156P HT C150x150-R5M**;
- High Temperature Charged Plate, 25mm x 25mm (1" x 1") - Model PD4002AP

**Complies with IEC 61340 Standard**

*Note: Other sizes and shapes of charge plates are available. Deionized water probes are also available (PM08035)*
Model 158A Charged Plate Monitor

Trek Model 158A Charged Plate Monitor is the premier instrument to evaluate the performance of air ionization systems. Its design includes a color graphics display for viewing of discharge waveforms and offset voltage in the time domain and the ability to store test data and waveforms for hundreds of ionizer tests. This unit employs Trek’s patented voltage-follower technique to provide accuracy, stability and bandwidth well beyond the performance capabilities of field meter technology.

Features

• Compliance to IEC 61340-5-1 and ANSI/ESD STM3.1
• User-friendly compact design
• Superior data collection and storage capability
• Large LCD color graphic display
• Navigate via touch screen or function keys
• Standard ion collecting plates available (see below)
• Operate in Float Mode, (+) Decay Mode, or (-) Decay Mode
• Programmable voltage balance and (+) and (-) discharge time
• Performs float voltage and discharge time EOS/ESD measurements
• Allows multiple operational and programing options
• Can be pre-set to perform automated tests
• Can store/retrieve previously defined test parameters
• Test data can be saved for future reference/retrieval
• Long battery life
• USB port enables data transfer
• Optional barcode scanner with bluetooth technology

Specifications

Measurement Range .................................................. 0 to ±1100V DC or peak AC
Large Signal Bandwidth .............................................. 80Hz (-3dB)
Monitor Output ....................................................... 1/200 of the plate voltage
Accuracy ............................................................. ±0.1% (Full Scale)
Offset Voltage .......................................................... ±10mV
Output Noise .......................................................... 10mV rms²
Operating Conditions
Temperature ........................................................... 5 to 35°C
Relative Humidity .............................................. to 80%RH, non-condensing

Power Supply ............................................ Built-in rechargeable battery (approx. 6 hours of continuous usage from a full charge); can also be operated using the supplied AC adapter.
Dimensions .................................................. 22.6cm W x 5.3cm H x 16.7cm D
Weight ............................................................. 2.2kg

Ion Collecting Plates

Standard ion collecting plates are ordered separately; standard 6” x 6” plate and standard 1” x 1” plate are available. Refer to relevant photos on prior page.

Model 158A Charged Plate Monitor Kit

This kit includes Model 158A charged plate monitor, standard 6” x 6” collecting plate, standard 1” x 1” collecting plate, charged plate handle, walking test adapter assembly, mini-tripod, and custom carrying case.

Please specify plate type(s) when ordering Model 158A. A Model 158A Charged Plate Monitor Kit is also available. See details below.
Model 511/1501  
**ESD Audit Kit**

Trek’s Model 511/1501 ESD Audit Kit includes the Model 511 Ionizer Kit (electrostatic field meter, charger, and charge plate) and Model 1501 (surface resistance meter) in a compact carrying case. Please refer to specifications below. Most items can be ordered individually. Refer to details below.

The carrying case and all of its contents are shown (far left). The kit as packaged for delivery is also shown (near left). Orders in the USA include ground plug adaptor, AC receptacle tester, and 2.75W charger/USB adaptor. (below).

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**Model 511 Electrostatic Field Meter**

**Features**
- Switch selectable measurement range
- Hand-held, portable, non-contacting
- Chopper-stabilized technology
- Reliable in ionized or non-ionized environments
- Complies with ANSI/ESD SP3.3

**Specifications**
- **Measurement Range** (per inch): 0 to ±2kV...OR... 0 to ±20kV
- **Measurement Accuracy**
  - Voltage Monitor Output: better than ±5% of reading, ±10mV
  - Voltage Display: better than ±5% of reading, ±2 counts
- **Operating Conditions**
  - Temperature: 10 to 30°C
  - Relative Humidity: to 80%, RH, non-condensing
- **Power Supply**: 9V alkaline battery (1), included

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**Model 1501 Surface Resistance Meter**

**Features**
- Auto-ranging
- Lightweight, hand-held
- Displayed values can be stored in internal memory
- Records temperature and relative humidity
- Built-in electrodes with conductive rubber

**Specifications**
- **Measuring Range**: $10^3$ to $10^2$
- **Display Range**: $1\times10^{-2}$ to $9\times10^1$ where $z$ = measuring range exponent
- **Accuracy**: 10% to 25% of reading (depends on measuring range)
- **Operating Conditions**
  - Temperature: -5 to 40°C
  - Relative Humidity: to 75%RH, non-condensing

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Power Supply: Rechargeable lithium battery, 3.6V 900mAh
Dimensions: 14.5cm H x 8.0cm W x 3.5cm D
Weight: 290g
Model 152-1  
Surface Resistance / Volume Resistance Meter

**Features**

- Accuracy, stability and repeatability in a lightweight, portable design
- Complies with IEC 61340-5-1 for Surface Resistance Measurements
- 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)
- Wide measurement ranges of $10^3$ to $10^{15}$
- Variety of probes available (see photo at right)
  - Model 152P-CR-1........ Surface resistance/volume resistance (center top)
  - Model 152P-2P......... Two-point surface resistance (center bottom)
  - Model 152BP-5P....... Point-to-point surface resistance (lower right)
  - Model 152AP-3mm x 25.4mm...... Miniature resistance probe (pair)
  - Part CN 1K039......................... Walking test adapter kit (lower left)

**Specifications**

Measurement Range .......................................................... $10^3$ to $10^{15}$
(using probe 152BP-5P, 152P-2P, or 152P-CR-1)
Test Voltage ............... Select 10V or 100V (±2%) using the selection switch
Power Supply ................. Two 9V alkaline batteries provide approx. 6 hours
                          of power for portable operation. AC line adapter
                          available for all global areas.

Operating Conditions

- Temperature ......................................................... 15 to 35°C
- Relative Humidity .............................................. 5 to 80%RH, noncondensing
- Dimensions ....................................................... 10.0cm W x 18.0cm H x 4.4cm D
- Weight .......................................................... 500g (includes battery)

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Model 901HS  
High-Sensitivity ESD Event Detector

**Features**

- Sensitive to ESD voltage levels as low as 10V at 50mm
- Well-suited for Charge Device Model (CDM) and discharge between
  metallic electrodes
- ESD event detection conveyed through visual and audible alert systems
- Good for difficult-to-reach locations (antenna-on-cable design)
- Compact, lightweight design and highly accurate data
- Operates on four AA batteries; AC power adapter for continuous
- Alternate antenna for less sensitive detection (50V @ 90mm)

**Specifications**

Indicators........................................ Audible alarm and 5 color-coded LEDs to visually
indicate intensity
- Alarm .......................................................... Automatic or manual reset control
- Dimensions ....................................................... 8.0cm W x 11.0cm H x 4.5cm D
- Weight .......................................................... 500g (includes battery)

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(Ce compliant)*
Model 950 Nozzle Ionizer

The Model 950 is a nozzle type air ionizer which removes dust contamination and eliminates static electricity by use of high pressure ionized air flow. The compact nozzle body contains a built-in high-voltage power supply and an abnormal operation detection/warning output circuit. Model 950 is operated by connecting a compressed air supply and a 24V power supply to the unit.

Using a high-frequency corona discharge, Model 950 enables the efficient elimination of static electricity. Selection of specific nozzles (from a variety of options, as shown on p.7) to transfer ionized air provides utility for Model 950 in a wide range of applications. The Model 950 uses an LED display and contact output to indicate abnormal conditions. The high voltage supply and ionizing electrode can be replaced easily through the back of the unit. These features facilitate easy cleaning and maintenance at the production line site, thereby reducing downtime.

Features

- Ultra-small compact body
- High voltage failure and emitter needle contamination detector function
- Outputs a relay signal when abnormal operating conditions occur
- Optional tubes allow transfer of ionized air to remote or difficult-to-reach locations
- Easy maintenance – built-in power supply with a replaceable emitter unit makes for easy cleaning and replacement
- Excellent ion balance
- A wide range of optional nozzles and tubes for various applications

How to replace or clean the discharge needle

LED Display (displays the information shown in the chart below)

Operating Conditions – LED Indicators

<table>
<thead>
<tr>
<th>Condition</th>
<th>“Power” Green LED</th>
<th>“H. V.” Green LED</th>
<th>“C. C.” Yellow LED</th>
<th>“Alarm” Red LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Operation</td>
<td>●</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H.V. Malfunction</td>
<td>●</td>
<td></td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>Maintenance Needed</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>(clean the needle)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H.V. Output Off</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Off</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please specify nozzle type(s) when ordering Model 950
Specifications
Discharge Method: High-frequency AC corona discharge method
Input Power Supply Voltage: 24V DC ±10%
Power: 2.4VA
Air Purge-Operation Pressure: 0.05 to 0.6MPa
Dimensions: 8.65cm D x 1.8cm W x 5.0cm H (main unit only)
Weight: Approx. 80g (main unit only)
Operating Conditions
Temperature: 0 to 40°C
Relative Humidity: 15 to 65% RH, noncondensing
Ozone Density: 0.05ppm or less (at a distance of 300mm from air outlet)
Ion Balance: ±15V or less (0.05 to 0.5MPa)
Material: Enclosure: ABS
Cover: Stainless steel
Discharge needle: tungsten
Air Piping Dimension: 6mm O.D.

Model 950 Optional Parts (length, material type and part numbers as noted)

Seamless carrier pipe nozzle
(950-C200 in photo)
100mm 950-C100
200mm 950-C200
300mm 950-C300
400mm 950-C400
500mm 950-C500

Bar nozzle
(950-200B in photo)
100mm 950-100B
200mm 950-200B
300mm 950-300B

Carrier tube nozzle
(950-TT in photo)
Teflon carrier tube nozzle 950-TT
Silicon carrier tube nozzle 950-ST

Shower nozzle
950-60S

Flat nozzle
950-F

AC Adapter (950-24VA in photo)
950-24VA AC Adapter
(power supply + signal cable + grounding wire)
950-24V AC Adapter
(power supply only)

Model 950 Other Optional Parts (part numbers as noted)
Bar nozzle L-type 950-100BL
Pipe nozzle 950-120PSP
Mounting Frame 950-FM

Main Unit Dimensions

Mounting Frame Dimensions
Electrostatic Voltmeters: Measurement Distance & Measurement Area

Model 520, 876

Model 523, 884

Model 541

Model 542P-45D probe

Figure 1. Spatial Resolution, Trek AC Feedback Electrostatic Voltmeter (i.e. Model 520)

Figure 2. Spatial Resolution, Trek DC Feedback Electrostatic Voltmeter (i.e. Model 541)

Figure 3. Measurement Accuracy vs. Measurement Distance

Figure 4. Spot Resolution at Selected Distances

www.trekinc.com
Trek offers two types of technology in the company’s Electrostatic Voltmeters. One product line utilizes DC feedback technology while the other product line is based on Trek’s novel approach to electrostatic measurement via patented AC feedback technology.

The DC Feedback Electrostatic Voltmeters use a well-known technology that Trek has employed for over 45 years (diagram below). The design utilizes a field-nulling method where the body of the probe is driven to the voltage being measured. This provides very high accuracy and fast speed of response. Since the probe is spaced relatively close to the surface being measured (1-2 mm typical) it is capable of measuring very small surface areas, with no arc over.

For a complete technical description of the DC Feedback Technology and AC Feedback Technology please contact Trek.

Figure 5. Theory of Operation – DC Feedback Electrostatic Voltmeter

Figure 6. Theory of Operation – AC Feedback Electrostatic Voltmeter
A ONE (1) YEAR Warranty applies to Trek’s products. TREK, INC. agrees to correct, either by repair, or in the company’s sole discretion, by replacement, any defect of material or workmanship which develops within one year from date of original purchase by the customer (user), provided that investigation and factory inspection by the company discloses that such defect developed under normal and proper use.

TREK, INC. provides calibration and repair services for all Trek products. We have Authorized Service Organizations located around the world. Please contact Trek’s Customer Service Department for assistance or go to www.trekinc.com to locate a service facility.

Trek’s rental program provides cost-effective access to equipment for short-term projects or emergencies. For more information, please contact Trek’s Sales Department.

Trek sends out updates about the company’s new products and other developments via email. Please send an email to Trek’s Marketing Department to be added to the distribution list.

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Trek products generate high voltage. Please read the instruction manual and notes carefully before using the instruments.

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