Hioki’s Chemical Impedance Analyzer IM3590 is designed to perform impedance (LCR) measurement of electrochemical components and materials. It offers functionality such as Cole-Cole plot generation and equivalent circuit analysis with a broad measurement frequency range of 1 mHz to 200 kHz, measurement speeds as high as 2 ms, and basic accuracy of ±0.05%. With the advanced display and analysis functionality required for research and development work and LCR measurement capability for standard electronic components, the instrument provides a single-device solution for a broad range of measurement applications.

Ideal for Measuring Electrochemical Impedance
Measure Electrochemical Components and Materials, Batteries, and EDLCs

**Cole-Cole plot**

In measurement of electrochemical components and materials, Cole-Cole plots are used to ascertain electrode, electrolyte ion, and other characteristics. The IM3590 can perform frequency sweep measurement using up to 801 points and display the results as a Cole-Cole plot.

![Cole-Cole plot screen (manganese battery)](image)

Measurement at low frequencies is necessary in order to measure characteristics such as ion behavior, and the IM3590 can conduct measurements at 1 mHz. The instrument’s upper limit frequency is 200 kHz, allowing it to measure solution resistance.

**Temperature measurement and time interval measurement**

When used in conjunction with an optional temperature probe, the IM3590 can display graphs that include measured temperatures. By assigning temperature to one axis on the X-Y display, it is possible to display a temperature characteristics graph. The instrument can also perform time interval measurement at up to 801 points, and can display graphs illustrating variation over time, including temperature measurement.

The temperature sensor (Sheath Type Temperature Probe 9478) has a waterproof sheath, allowing it to be directly inserted into solutions.

Sheath material: SUS316

**Battery measurement function**

The IM3590’s battery measurement function simplifies the process of measuring battery impedance characteristics in a no-load state by automatically measuring the battery voltage and superimposing the same voltage from the instrument as DC bias.

Supported battery specifications
- Internal impedance: 10 mΩ to 10 Ω
- Battery voltage: 5 V max

![Measurement of alkaline batteries](image)

**Battery measurement function**

**Advantage**

- Measurement of alkaline batteries
- Measurement time and Z repeatability during low-resistance measurement

**Reference values**

Measurement time [ms]

<table>
<thead>
<tr>
<th>Measurement frequency</th>
<th>Sample</th>
<th>HIOKI 3522-50</th>
<th>IM3590</th>
</tr>
</thead>
<tbody>
<tr>
<td>100Hz</td>
<td>10mΩ</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>500Hz</td>
<td>5mΩ</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>1kHz</td>
<td>10mΩ</td>
<td>100</td>
<td>50</td>
</tr>
</tbody>
</table>

**Improved!**

- **FAST**
- **MED**
- **SLOW**
- **SLOW2**
Electrochemical equivalent circuit analysis

The ability to measure electrochemical components and materials makes possible evaluation by estimating equivalent circuits, facilitating a deeper understanding of reaction, electrode, and electrolyte characteristics. The IM3590 provides electrochemical component and material equivalent circuit models, allowing evaluation of solution resistance, charge transfer resistance, and electric double-layer capacitance.

Equivalent circuit analysis result

Equivalent circuit model

![Image of electrochemical equivalent circuit analysis](image)

Equivalent circuit analysis screen (alkaline battery)

### Equivalent circuit models and measurement parameters

#### Unipolar models

1. ![Unipolar model](image)
   - Unipolar, or all poles have the same reaction, and the center of the capacitive semicircle lies on the real axis

2. ![Unipolar model](image)
   - Unipolar, or all poles have the same reaction, and the center of the capacitive semicircle does not lie on the real axis

#### Polar models

3. ![Polar model](image)
   - Different poles have different reactions, and the center of the capacitive semicircle lies on the real axis

4. ![Polar model](image)
   - Different poles have different reactions, and the center of the capacitive semicircle does not lie on the real axis

### Measurement parameters

- \( R_s \) (Solution resistance)
- \( R_1, R_2 \) (Charge transfer resistance)
- \( C_1, C_2 \) (Electric double layer capacitance)
- \( CPE_1, CPE_2 \) (Constant Phase Element)
- \( L_1 \) (Inductance)

### Internal structure of a standard electrochemical cell

- \( C_1 (CPE_1) \): Electric double layer capacitance
- \( R_1 \): Charge transfer resistance
- \( L_1 \): Electrode and wiring inductance
- \( C_2 (CPE_2) \): Electric double layer capacitance
- \( R_s (R_{sol}) \): Solution resistance
Electronic Components
(LCR Elements and Piezoelectric and Resonant Elements)

Sweep function (Frequency and signal level)

The IM3590 can perform sweep measurement of the frequency characteristics of standard LCR components such as electronic components and piezoelectric elements (resonant components). The ability to display frequency characteristics, admittance circles, and Cole-Cole plots makes it easy to assess characteristics. The instrument can also perform signal level (V/CV/CC) and DC bias voltage sweep operation.

Equivalent circuit analysis of electronic components

The IM3590 offers five equivalent analysis circuits for circuit components, allowing the instrument to be used to estimate and evaluate standard LCR components such as electronic components and piezoelectric elements (resonant components).

- **Equivalent Circuit Model and Measurement Items**
  - **Three-element model**
    - Measurement items
      - L1 (Inductance)
      - C1 (Capacitance)
      - R1 (Resistance)
      - Qm (Resonance sharpness)
    - The following measurement items can be captured via PC communication.
      - f_r (Resonance frequency)
      - f_a (Anti-resonance frequency)

  - **Four-element model**
    - Measurement items
      - L1 (Inductance)
      - C0 (Parallel capacitance)
      - R1 (Resistance)
      - Qm (Resonance sharpness or mechanical quality coefficient)
    - The following measurement items can be captured via PC communication.
      - f_r (Resonance frequency)
      - f_a (Anti-resonance frequency)
      - f_s (Series resonance frequency)
      - f_p (Parallel resonance frequency)
      - f_m (Maximum admittance frequency)
      - f_n (Minimum admittance frequency)
      - f_1 (Maximum susceptance frequency)
      - f_2 (Minimum susceptance frequency)

Saving and reading data via front-loading USB port

Measurement results and settings can be saved to a commercially available USB flash drive connected to the front panel.

(The USB port on the front panel is specifically for a USB flash drive. Batch save all measurement results to a USB flash drive after saving them to the internal memory of IM3590. Some USB flash drives may not be supported due to incompatibility issues.)

Connecting to a PC or PLC via RS-232C, LAN, or GP-IB (select one option) connection

Users can also select an optional RS-232C, LAN, or GP-IB interface if needed. IM3590 functions can be controlled from a PLC or computer, and measurement results can be downloaded. (Certain functions, including instrument power on/off and interface configuration, cannot be controlled remotely.)

Download the LabView driver from the HIOKI website at http://www.hioki.com.

External I/O can be used to output measurement complete and judgment result signals and to receive measurement trigger and other signals in order to facilitate control of the instrument.
Guaranteed accuracy at measurement cable lengths of up to 4 m
A 4-terminal pair configuration reduces the influence of measurement cables, allowing accuracy to be guaranteed to a length of 4 m and simplifying connections to large samples as well as wiring of automated equipment. (The frequency range over which accuracy is guaranteed varies with the cable length.)

Basic accuracy of ±0.05%
Thanks to Z basic accuracy of ±0.05%, the IM3590 offers a level of accuracy that is ideal for use in applications ranging from component testing to research and development.

Measurement times as short as 2 ms
The IM3590 can perform measurements in as little as 2 ms using the FAST measurement speed setting with a measurement frequency of 1 kHz.

Wide setting range for measurement frequency
IM3590 allows DC or a frequency band within the range of 1 mHz to 200 kHz to be set with five-digit resolution (testing at less than 100 Hz has a 1 mHz resolution). This enables the measurement of resonance frequency and measurement and evaluation in a state close to that of actual operating conditions.
The IM3590’s frequency range extends from the low frequencies that are required for electrochemical impedance measurement in order to assess phenomena such as ion behavior to high frequencies that allow measurement of solution resistance.

Wide setting range for measurement voltage and current
In addition to normal open-loop signal generation, this instrument enables measurement considering voltage/current dependence in constant voltage and constant current modes. The signal levels can be set over wide ranges, from 5 mV to 5 V, and from 10 μA to 50 mA. (The setting range of measurement signal levels differs depending on the frequency and measurement mode.)

Wide setting range for measurement frequency
IM3590 allows DC or a frequency band within the range of 1 mHz to 200 kHz to be set with five-digit resolution (testing at less than 100 Hz has a 1 mHz resolution). This enables the measurement of resonance frequency and measurement and evaluation in a state close to that of actual operating conditions.
The IM3590’s frequency range extends from the low frequencies that are required for electrochemical impedance measurement in order to assess phenomena such as ion behavior to high frequencies that allow measurement of solution resistance.

Basic performance
- Measurement times as short as 2 ms
- Wide setting range for measurement frequency
- Wide setting range for measurement voltage and current

Intuitive operation with touch panel
A touch panel display with intuitive operation is inherited from previous models. Furthermore, the incorporation of a color LCD means the display is easy to view, and outstanding operability which ensures you intuitively know what to do helps improve work efficiency.

Simultaneous display of four parameters (during normal measurement)
The IM3590 can display four parameters simultaneously during normal measurement, making it easy to check among parameters.

Measurement conditions such as the measurement frequency and measurement signal level can be changed while you monitor the measurement values.

Functions and Features to Simplify the Operation of LCR Measurements
- Measurement parameter input screen
- Setting items of basic measurement conditions

Measurable parameters
<table>
<thead>
<tr>
<th>Z  (impedance[Ω])</th>
<th>Ls (series inductance[H])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y (admittance[S])</td>
<td>Lp (parallel inductance[H])</td>
</tr>
<tr>
<td>θ (phase angle[°])</td>
<td>Cs (series capacitance[F])</td>
</tr>
<tr>
<td>Rs (Equivalent series resistance = ESR[Ω])</td>
<td>Cp (parallel capacitance[F])</td>
</tr>
<tr>
<td>Rp (Parallel resistance[Ω])</td>
<td>Q (Q factor (Q = 1/D))</td>
</tr>
<tr>
<td>Rd (DC resistance[Ω])</td>
<td>D (loss coefficient = tanδ)</td>
</tr>
<tr>
<td>X (reluctance[Ω])</td>
<td>T (temperature[℃])</td>
</tr>
<tr>
<td>G (conductance[S])</td>
<td>σ (conductivity[S/m])</td>
</tr>
<tr>
<td>B (susceptance[S])</td>
<td>ε (dielectric constant[F/m])</td>
</tr>
</tbody>
</table>
### IM3590 measurement accuracy

**Conditions**
At least 60 minutes after power-on, after performing open and short compensation, with a temperature and humidity range of 23°C ±5°C and relative humidity of 80% or less (non-condensing).

(Outside the range of 23°C ±5°C, accuracy can be calculated from 0°C to 40°C by multiplying the basic accuracy by the temperature coefficient G.)

**Basic accuracy**

**Guaranteed accuracy period:** 1 year

When all coefficients by which the basic accuracy is multiplied (signal level of 1 V or Rdc measurement, measurement speed of SLOW2, measurement cable length of 0 m) are the same, the basic accuracy is the measurement accuracy.

#### Guaranteed accuracy

<table>
<thead>
<tr>
<th>Range</th>
<th>Guaranteed accuracy range</th>
<th>DC(Rdc)</th>
<th>0.001Hz to 99.999Hz</th>
<th>100.00Hz to 9999Hz</th>
<th>1.000kHz to 10.000kHz</th>
<th>10.01kHz to 100.00kHz</th>
<th>100.01kHz to 200.00kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>100MΩ</td>
<td>8MΩ to 200MΩ</td>
<td>A=1</td>
<td>B=1</td>
<td>A=6</td>
<td>A=6</td>
<td>A=3</td>
<td>A=3</td>
</tr>
<tr>
<td>10MΩ</td>
<td>800kΩ to 10MΩ</td>
<td>A=0.5</td>
<td>B=0.3</td>
<td>A=0.8</td>
<td>A=0.8</td>
<td>A=0.5</td>
<td>A=0.5</td>
</tr>
<tr>
<td>800kΩ to 10MΩ</td>
<td>A=0.2 B=0.1</td>
<td>A=0.4</td>
<td>B=0.08</td>
<td>A=0.3</td>
<td>A=0.3</td>
<td>A=0.3</td>
<td>A=0.3</td>
</tr>
<tr>
<td>10kΩ</td>
<td>8kΩ to 1MΩ</td>
<td>A=0.1</td>
<td>B=0.01</td>
<td>A=0.3</td>
<td>A=0.3</td>
<td>A=0.1</td>
<td>A=0.1</td>
</tr>
<tr>
<td>1kΩ</td>
<td>800Ω to 10kΩ</td>
<td>A=0.1</td>
<td>B=0.01</td>
<td>A=0.3</td>
<td>A=0.3</td>
<td>A=0.1</td>
<td>A=0.1</td>
</tr>
<tr>
<td>10Ω</td>
<td>800mΩ to 1Ω</td>
<td>A=0.2</td>
<td>B=0.15</td>
<td>A=0.5</td>
<td>A=0.5</td>
<td>A=0.3</td>
<td>A=0.3</td>
</tr>
<tr>
<td>8Ω</td>
<td>80mΩ to 1Ω</td>
<td>A=0.3</td>
<td>B=0.3</td>
<td>A=2</td>
<td>A=2</td>
<td>A=2</td>
<td>A=2</td>
</tr>
<tr>
<td>100Ω</td>
<td>10mΩ to 100mΩ</td>
<td>A=3</td>
<td>B=3</td>
<td>A=10</td>
<td>A=10</td>
<td>A=3</td>
<td>A=3</td>
</tr>
</tbody>
</table>

**Method for determining basic accuracy**
- Calculate the basic accuracy from the sample impedance, measurement range, and measurement frequency and the corresponding basic accuracy and coefficient B from the table above.
- The calculation expression to use differs for each of the 1 kΩ range and above and 100 Ω range and below.
- For C and L, obtain basic accuracy A and coefficient B from the table above.
- For the measurement range from the actual measurement value of impedance or the approximate impedance value calculated with the following expression.

\[
Z_x (\Omega) = \frac{1}{\omega C (F)} (\theta = -90^\circ)
\]

\[
Z_x (\Omega) = \frac{1}{\omega L (H)} (\theta = 90^\circ)
\]

\[
Z_x (\Omega) = R (\Omega) \times \omega \times f (\text{measurement frequency} [\text{Hz}])
\]

**Calculation example**

Impedance Zx of sample: 500 Ω (actual measurement value)

Measurement conditions: When frequency 10 kHz and range 1 kΩ

Insert coefficient A = 0.15 and coefficient B = 0.02 for the Z basic accuracy from the table above into the expression.

\[
Z \text{ basic accuracy} = 0.15 + 0.02 x \left( \frac{10 \times 500}{10} \right) = 0.23 \text{ (±%rdg.)}
\]

Similarly, insert coefficient A = 0.08 and coefficient B = 0.02 for the θ basic accuracy, as follows:

\[
\theta \text{ basic accuracy} = 0.08 + 0.02 x \left( \frac{10 \times 500}{10} \right) = 0.16 \text{ (deg.)}
\]

**Conditions**

- DC bias setting OFF: 1
- DC bias setting ON: 2
- Operating temperature
  - When t is 18°C to 28°C: 1
  - When t is 0°C to 18°C or 28°C to 40°C: 1 + 0.1 x [t-23]

**Calculation expression**

In the 1 kΩ range and above:

\[
\text{Accuracy} = A + B \times 10 \times Z_x \frac{\text{Range}}{\text{radg.}}
\]

When all coefficients by which the basic accuracy is multiplied (signal level of 1 V or Rdc measurement, measurement speed of SLOW2, measurement cable length of 0 m) are the same, the basic accuracy is the measurement accuracy.

**Method for determining basic accuracy**

- Calculate the basic accuracy from the sample impedance, measurement range, and measurement frequency and the corresponding basic accuracy and coefficient B from the table above.
- The calculation expression to use differs for each of the 1 kΩ range and above and 100 Ω range and below.
- For C and L, obtain basic accuracy A and coefficient B from the table above.
- For the measurement range from the actual measurement value of impedance or the approximate impedance value calculated with the following expression.

\[
Z_x (\Omega) = \frac{1}{\omega C (F)} (\theta = -90^\circ)
\]

\[
Z_x (\Omega) = \frac{1}{\omega L (H)} (\theta = 90^\circ)
\]

\[
Z_x (\Omega) = R (\Omega) \times \omega \times f (\text{measurement frequency} [\text{Hz}])
\]
**IM3590 measurement accuracy**

**Guaranteed accuracy range (measurement signal level)**
The guaranteed accuracy range differs depending on the measurement frequency, measurement signal level, and measurement range.

<table>
<thead>
<tr>
<th>Range</th>
<th>DC 0.001Hz to 99.999Hz</th>
<th>100.00Hz to 99.999Hz</th>
<th>1.0000kHz to 10.000kHz</th>
<th>10.001kHz to 100.00kHz</th>
<th>100.01kHz to 200.00kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>100MΩ</td>
<td>0.101 V to 5 V</td>
<td>0.101 V to 5 V</td>
<td>0.501 V to 5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10MΩ</td>
<td>0.050 V to 5 V</td>
<td>0.050 V to 5 V</td>
<td>0.050 V to 5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1MΩ</td>
<td>0.005 V to 5 V</td>
<td>0.101 V to 5 V</td>
<td>0.101 V to 5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10kΩ, 1kΩ, 100Ω</td>
<td>0.01 V to 5 V</td>
<td>0.005 V to 5 V</td>
<td>0.01 V to 5 V</td>
<td>0.01 V to 5 V</td>
<td>0.01 V to 5 V</td>
</tr>
<tr>
<td>10Ω</td>
<td>0.501 V to 5 V</td>
<td>0.501 V to 5 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100mΩ</td>
<td></td>
<td></td>
<td>0.01 V to 5 V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above voltages are the voltage setting values that correspond to when in V mode.

In the 10 MΩ to 1 kΩ range, the guaranteed accuracy range is as follows when measured values (impedance values) exceed the range.

<table>
<thead>
<tr>
<th>Range</th>
<th>DC 0.001Hz to 99.999Hz</th>
<th>100.00Hz to 99.999Hz</th>
<th>1.0000kHz to 10.000kHz</th>
<th>10.001kHz to 100.00kHz</th>
<th>100.01kHz to 200.00kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>100MΩ</td>
<td>0.101 V to 5 V</td>
<td>0.101 V to 5 V</td>
<td>0.501 V to 5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10MΩ</td>
<td>0.101 V to 5 V</td>
<td>0.101 V to 5 V</td>
<td>0.501 V to 5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1MΩ</td>
<td>0.101 V to 5 V</td>
<td>0.101 V to 5 V</td>
<td>0.501 V to 5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10kΩ</td>
<td>0.005 V to 5 V</td>
<td>0.005 V to 5 V</td>
<td>0.005 V to 5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10Ω</td>
<td>0.005 V to 5 V</td>
<td>0.005 V to 5 V</td>
<td>0.005 V to 5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100mΩ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above voltages are the voltage setting values that correspond to when in V mode.

### Specifications

<table>
<thead>
<tr>
<th>Measurement modes</th>
<th>LCR mode: measurement with single condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continuous measurement mode:</td>
</tr>
<tr>
<td></td>
<td>Measures under saved conditions continuously</td>
</tr>
<tr>
<td></td>
<td>LCR mode (maximum of 60 sets)</td>
</tr>
<tr>
<td></td>
<td>Analyzer mode (maximum of 2 sets)</td>
</tr>
<tr>
<td></td>
<td>Analyzer: measurement frequency or frequency level sweep operation, temperature characteristics, equivalent circuit analysis (Measurement points: 2 to 801)</td>
</tr>
<tr>
<td></td>
<td>Measurement method: normal sweep or sweep segment sweep, Display: List display or graph display</td>
</tr>
<tr>
<td>Measurement parameters</td>
<td>Z, Y, θ, Rx(SR), Rp, Rdc(DC resistance), X, G, B, Cs, Cp, Ls, Lp, D(tanδ), Q, θ, α, ε: ±(0.000% to 999.999%)</td>
</tr>
<tr>
<td>Measurement range</td>
<td>100 mΩ to 100 MΩ, 10 ranges (All parameters are determined according to Z) Guaranteed accuracy range: 10 mΩ to 200 MΩ</td>
</tr>
<tr>
<td>Display range</td>
<td>Z, Y, Rs, Rp, Rdc, X, G, B, Cs, Ls, Cp, α, ε: ±(0.000% to 999.999%)</td>
</tr>
<tr>
<td>Basic accuracy</td>
<td>Z: ±0.05%/deg. 0: ±0.03°</td>
</tr>
<tr>
<td>Measurement frequency</td>
<td>1 mHz to 200 kHz (1 mHz to 10 Hz steps)</td>
</tr>
</tbody>
</table>

### DC bias measurement

Normal mode: -5.00 V to 5.00 VDC (10 mV steps)
Low impedance high accuracy mode: 2.50 V to 2.50 V (10 mV steps)

### DCR (DC resistance) measurement

Measurement signal: Fixed to 2 V
Temperature compensation function: Converted reference temperature is displayed
Reference temperature setting range: -25°C to 99°C
Temperature coefficient setting range: -99.9999°C/°C to 99.9999°C/°C

### Temperature measurement function

Temperature range: -5°C to 99°C
Sampling cycle: Around 640ms

### Comparator

LCR mode: Hi/IN/Lo for 2 parameters

### BIN measurement

10 classifications and out of range for 2 parameters

### Compensation

Open/short/load/correlation compensation
Cable length: 0, 1, 2 and 4 m

### Residual charge protection function

V = ±10°C (C: Capacitance [F] of test sample, V = max. 400 V)

### Trigger synchronous output function

Applies a measurement signal during analog measurement only

### Averaging

1 to 256

### Panel loading/saving

LCR mode: 60; Analyzer mode: 2; Compensation value: 128

### Memory function

Stores 32,000 data items to the memory of the instrument

### Interfaces

EXT I/O (handler), USB (Hi-Speed), USB flash drive (Option: RS-232C, GP-IB, LAN (10BASE-T/100BASE-TX), Only 1 Optional Interface can be installed at any one time

### Operating temperature and humidity ranges

-0°C (32 °F) to 40°C (104 °F), 80% RH or less, no condensation

### Storage temperature and humidity ranges

-10°C (14 °F) to 55°C (131 °F), 80% RH or less, no condensation

### Power supply

100 to 240 V AC, 50/60 Hz, 50 VA max.

### Dimensions and mass

Approx. 330 W x 199 H x 168 D mm, approx. 3.1 kg
Approx. 12.99“ W x 4.69” H x 6.61” D, approx. 109.3 oz.

### Accessories

Power Cord x 1; Instruction Manual x 1, CD-R (Communication Instruction Manual and Sample Software (Communications Control, Accuracy Calculation, and Screen Capture Functionality)) x 1

### Applicable standards

EMC: EN61326-1, EN61000-3-2, EN61000-3-3
Safety standard: EN61010-1
Options

Four-Terminal Probe for Electrochemical Measurement

Four-terminal pair configuration, measurable conductor diameter: ø0.3 mm (0.01 in) to 2 mm (0.08 in)

Cable length 1 m (3.28 ft), DC to 200 kHz, impedance characteristics of 50 Ω

DC Bias Unit

Direct connection type, 40 Hz to 8 MHz, maximum applied voltage of DC ±40 V.

When using the 9268-10 or 9269-10, external constant-voltage and constant-current sources are required.

Probes and Test Fixtures for Lead Components

Four-terminal probe 9650-10

Cable length 1 m (3.28 ft), DC to 200 kHz, impedance characteristics of 50 Ω, 4-terminal pair configuration, measurable conductor diameter: ø0.3 mm (0.01 in) to 2 mm (0.08 in)

Test Fixtures for SMD

SMD TEST FIXTURE 9263

Direct connection type, DC to 8 MHz, Test sample dimensions: 1.0 mm (0.04 in) to 10 mm (0.39 in)

SMD TEST FIXTURE 9677

Direct connection type, Electrodes on side for SMD, DC to 120 MHz, Test sample dimensions: 3.5 mm ±0.5 mm (0.14 in ±0.02 in)

SMD TEST FIXTURE IM9100

Direct connection type, Electrodes on bottom for SMD, DC to 120 MHz, Test sample dimensions: 1.0 mm (0.04 in) to 4.0 mm (0.16 in) wide, maximum 1.5 mm (0.06 in) high

Compatible with 0402-, 0603-, and 1005-size SMDs, 4-terminal electrode design, capable of high-precision measurement

SMD TEST FIXTURE 9269-10

Direct connection type, Electrodes on side for SMD, DC to 120 MHz, Test sample dimensions: 1.0 mm (0.04 in) to 10 mm (0.39 in)

Test sample dimensions: 1.0 mm (0.04 in) to 4.0 mm (0.16 in) wide, maximum 1.5 mm (0.06 in) high

Options for L2001

CONTACT TIPS IM9091

Compatible sizes: 368/1 to 579 (3S)

CONTACT TIPS IM9092

Compatible sizes: 968/7 to 579 (2S)

*For RS-232C cable, a crossover cable for interconnection can be used.

Interface Unit (Only 1 can be installed at any one time)

GP-IB INTERFACE Z3000

RS-232C INTERFACE Z3001*

LAN INTERFACE Z3002

*RS-232C cable

For RS-232C cable, a crossover cable for interconnection can be used. The RS-232C cable 9657 (9-pin to 9-pin, crossed cable) cannot be used for applications involving the flow control of hardware.

Temperature Probe

Type: SHEATH TYPE TEMPERATURE PROBE 9478

Pt100, tip ø2.3 mm (0.09 in), cord length 1 m (3.28 ft), waterproof structure, waterproof property: EN60529:1991, IP67

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