RESISTANCE METER RM3545

Featuring super-high accuracy and multi-channel capabilities
(20 channels with 4-terminal measurement)

- Basic accuracy: 0.006%
- No. of display digits: Max. 6.5
- Max. resolution: 0.01μΩ (LP) 0.01mΩ

RESISTANCE METER RM3544

High-accuracy bench-top meter ideal for production lines

- Basic accuracy: 0.02%
- No. of display digits: Max. 4.5
- Max. resolution: 1μΩ
Choose from two models based on your application

**Super-high accuracy and multi-channel capabilities**
for advanced development and production applications

- Resistance measurement
  - Basic accuracy: **0.006%**
  - Max. resolution: **0.01μΩ**
  - Max. measurable current: **1A**

- Low power resistance measurement
  - Basic accuracy: **0.2%**
  - Max. resolution: **0.01μΩ**
  - Max. measurable current: **1mA**
  - Max. Open-circuit voltage: **20mV**

**Applications**

- Small-signal contacts
  - RM3545

- Compact fuses, airbag inflator, compact magnetic components (EMC filters, ferrite beads)
  - RM3545

- Multi-contact resistance measurement (motor and transformer windings)
  - RM3545-02

**General specifications**

<table>
<thead>
<tr>
<th>RESISTANCE METER RM3545</th>
<th>RESISTANCE METER RM3544</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00μΩ to 1200MΩ</td>
<td>0.000 mΩ to 3.5 MΩ</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

- Measurement types (4-terminal direct current)
  - Temperature measurement, Temperature correction (TC), comparator, judgment sound setting, auto hold
  - Low power resistance measurement (LP)
  - Temperature rise (Temperature conversion (ΔT))
  - Offset voltage compensation (OVC)
  - D/A output
  - RM3545-02: Max. 20ch

**High-accuracy bench-top meter**
for both manual operation and integration with automatic lines

- Basic accuracy: **0.02%**
  - Max. resolution: **1μΩ**
  - Max. measurable current: **300mA**

**Applications**

- Motors, solenoids, choke coils, transformers, wire harnesses
  - RM3545 RM3544

- Contacts, wire harnesses, relay contacts, switches
  - RM3545 RM3544

- Fuses, resistors, heaters, wires, welds
  - RM3545 RM3544

- Conductive rubber, paint
  - RM3545 RM3544

**General specifications**

- Measurement types (4-terminal direct current)
  - Basic accuracy: **0.006%**
  - Max. resolution: **0.01μΩ**
  - Max. measurable current: **1A**

- Low power resistance measurement
  - Basic accuracy: **0.2%**
  - Max. resolution: **0.01μΩ**
  - Max. measurable current: **1mA**
  - Max. Open-circuit voltage: **20mV**

- Multi-contact resistance measurement (motor and transformer windings)
  - RM3545-02

- Compact fuses, airbag inflator, compact magnetic components (EMC filters, ferrite beads)
  - RM3545

- Multi-contact resistance measurement (motor and transformer windings)
  - RM3545-02
Multi-point measurement with the Multiplexer Unit Z3003
(20 locations with 4-terminal measurement)

Scanning measurement using the Multiplexer Unit Z3003 is convenient in applications that require multi-contact measurement, for example when testing network resistors, steering switches, or 3-phase motor windings. Simply insert a Z3003 unit into one of the slots on the back of the RM3545-02 to enable scanning measurement of up to 20 locations* with 4-terminal measurement.

(*When using two Z3003 units, up to 42 locations can be measured with 2-terminal measurement.)

Application 1.
Measuring a 3-phase motor winding

Application 2.
Testing a connector or wiring harness

Application 3.
Testing a relay

Application 4.
Testing battery terminal welds

Probes suited to manual measurement on production lines

CLIP TYPE LEAD L2101
PIN TYPE LEAD L2102
PIN TYPE LEAD L2103
4-TERMINAL LEAD L2104

A Full Line-up of HIOKI Resistance Meters to Suit Your Measurement Range

- RM3545
  - 0.01μΩ
  - 1μΩ
  - 3.5MΩ
  - 1200MΩ
- RM3544
  - 0.1μΩ
  - 3.5MΩ
- RM3548
  - 0.01μΩ
  - 1.2kΩ
  - 120MΩ
- RM3543
  - 2 x 10^9Ω
- RM3542
  - 50Ω
- SM7120
Simplifying high-accuracy resistance measurement

Standard features of the high-accuracy Resistance Meter RM3545 and RM3544

- Convenient wide range options
  - RM3545
  - RM3544

Overview of the RM3545
Measure from 0.00 μΩ to 1200.0 MΩ
0.01 μΩ max. resolution, 0.006% basic accuracy
Max. measurable current of 1 A

The RM3545 can perform resistance measurement with a 6.5-digit, 1,200,000-count display at a maximum resolution of 0.01 μΩ. It delivers more than enough capabilities to be used in applications requiring high-resolution resistance measurement, for example in testing inverter motor windings.

High-resistance materials such as conductive sheets and conductive rubber are often used in electronic components. The RM3545 can measure resistance values of up to 1,200 MΩ. It also delivers maximum accuracy of 0.006%, enabling researchers to test state-of-the-art current sensing resistors.

Overview of the RM3544
Measure from 0.000 m Ω to 3.500 M Ω
1 μΩ max. resolution, 0.02% basic accuracy
Max. measurable current of 300 mA

As inverter-equipped power supply equipment uses increasingly high currents and frequencies, increasingly low-resistance and low-loss inductors are being incorporated in their circuitry, prompting a need for the ability to measure lower resistance levels with a high level of stability. With a resolution of 1 μΩ, the RM3544/RM3544-01 satisfy these needs.

Electronic components make extensive use of high-resistance substrates such as conductive sheets and rubber, and the RM3544/RM3544-01 deliver the ability to measure up to 3.5 MΩ. Moreover, the instruments’ maximum accuracy of 0.02% allows them to be used in testing current detectors with a precision of 0.1%.

Guaranteed accuracy with no warm up or zero-adjustment
For the RM3545/RM3544, accuracy is guaranteed immediately after startup, without any warm up or zero-adjustment.

Offset Voltage Compensation (OVC)
Thermal EMF occurs at connections between different metals. This force can affect measurement and, if large enough, introduce a measurement error. The RM3545’s offset voltage correction (OVC) function reduces the effects of thermal EMF to enable more precise measurement.

Temperature correction
Generally, the resistance of copper wiring changes with temperature by 0.4% per degree Celsius. The RM3544/RM3545 provide a temperature correction function to convert the observed resistance value \( R_t \) at the current temperature \( t \) to the resistance value \( R_{t_0} \) at the reference temperature \( t_0 \).

*Requires the Temperature Sensor Z2001 or a thermometer capable of generating analog voltage output (an infrared thermometer or similar instrument).

<table>
<thead>
<tr>
<th>Types of temperature input</th>
<th>RM3544: Temperature Sensor (Z2001)</th>
<th>RM3545: Temperature Sensor (Z2001), Analog voltage input (from an infrared thermometer or similar instrument)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference temperature setting range</td>
<td>-10.0 to 99.9 °C</td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient setting range</td>
<td>RM3544: -9,999 to 9,999 ppm/°C</td>
<td>RM3545: -99,999 to 99,999 ppm/°C</td>
</tr>
</tbody>
</table>
Super-high-accuracy, multi-channel resistance meter for use in advanced development and production applications

Key Features of the RM3545

- **Low-power (LP) resistance measurement**
  The RM3545 can perform measurement at a resolution of 10 μΩ at 1 mA (using the 1,000 mΩ range). With an open-terminal voltage of 20 mV or less, the instrument is ideally suited for measuring the contact resistance of chip inductors and signal contacts.

- **D/A output**
  The RM3545 converts resistance measured values into DC voltage for output. This capability is convenient when continuously recording changes in resistance, for example as detected by a sensor, with a logger or other piece of equipment.

- **High/low current selection by range**
  Select the optimal measurement current by switching between high and low settings according to the characteristics of the sample.

- **Extensive contact check functionality**
  The RM3545 can detect erroneous measurements caused by improper contact, reducing the risk that improperly judged or unchecked parts will be shipped by mistake. Contact check functionality is also provided for 4-terminal measurement.

- **Temperature input (temperature sensor terminal)**
  Input temperature data for use in temperature correction using either the Temperature Sensor Z2001 or a DC voltage (0 to 2 V). Connect a thermometer that can generate DC voltage output, for example an infrared thermometer, to perform temperature correction.

- **Temperature conversion function: Useful in temperature-rise testing**
  Temperature increase (Δt) is obtained and displayed by converting resistance measurements and ambient temperature.

- **Extensive contact check functionality**
  The RM3545 can detect erroneous measurements caused by improper contact, reducing the risk that improperly judged or unchecked parts will be shipped by mistake. Contact check functionality is also provided for 4-terminal measurement.

- **Auto-scanning and step scanning**
  When using the Multiplexer Unit Z3003 to perform scanning measurement, you can select either step scanning or auto scanning depending on the test conditions. Auto scanning is convenient when you require only an overall judgment result at the completion of scanning, while step scanning is convenient when you wish to generate judgments in real time using the instrument’s EXT I/O interface.

- **Comparator judgments based on measurement results**
  Measurement targets that are susceptible to the effects of temperature, for example thermistors and temperature transducers, can be compared with a reference element to generate a judgment.

- **Flexible pin assignments**
  The ability to freely combine A terminal pin(s) with B terminal pin(s) for each channel makes it possible to perform measurement using wiring that has been optimized for a variety of measurement targets.

- **Acquiring Total judgment results from EXT I/O**
  The multiplexer’s total judgment result (T_PASS, T_FAIL, T_ERR) can be acquired from EXT I/O. Similarly, step scan judgment results can be acquired for each step.

- **Configuration using a computer**
  Multiplexer settings can be configured using the keys on the instrument, communications commands, or a computer application (sample PC application). The sample application can be downloaded from Hioki’s website (http://www.hioki.com).
Easy-to-use RESISTANCE METER
suits both manual operation and integration with automatic lines

High-intuitive advanced functionality

1. Guard terminals
Minimize the effects of external noise on measurements.
*GUARD terminal is the shield potential.
This terminal is not for guarding network resistance measurements.

2. Simple control over basic settings
Range and measurement speed can be controlled directly.

3. LED COMPARATOR ATTACHMENT (Option)
The LED Comparator Attachment indicates judgment results with green and red LEDs, eliminating the need to look at the instrument’s screen and increasing work efficiency. Since the lamps do not light up when the measurement leads are open, the attachment can also be used to verify the connection status.

4. High-volume, user-selectable judgment tones
The RM3544 indicates results with a high-volume judgment tone of 85 dB or greater to ensure it is audible near noisy machinery. Both the RM3545 and RM3544 feature user-selectable judgment tones so workers don’t confuse judgment results on lines where multiple resistance meters are being used.

5. Functionality for saving and loading panels
The RM3545 (RM3544) can save and load up to 30* (10) sets of range, comparator, and other settings. Naming each set of panel data lets you make setup changes among production lots and lines smoothly and effortlessly.
*When using the multiplexer terminals, up to 8.

6. Material-and temperature-independent temperature correction function
The temperature correction function can be used to convert resistance values that vary with the ambient temperature to a reference value at a reference temperature using the Temperature Sensor Z2001 and a user-specified resistance temperature coefficient.

7. Scaling
The scaling function can be used to convert resistance values into physical properties such as length.
Conversion formula : \( R_s = A \times R + B \)
\( A, B \) : Constants, \( R \) : Measurement value
\( R_s \) : Resistance value

High-precision specs in a compact package

8. Comparator Function
The comparator function compares measured values to a previously set reference value or range and then displays and outputs the judgment result. The RM3545 and RM3544-01 can also output this information using EXT I/O.

Footprint of just 215 × 166 mm
Compared to the previous model (HIOKI 3540), the RM3544/RM3544-01 take up approximately 25% less installation space. This space-saving design frees up space in front of the instrument and lets you build compact production lines.
Ability to extend measurement cable length

The new instruments feature better wiring resistance tolerances than previous models (the 3541 and 3540). Wiring resistance can now be as high as 1.5 Ω for the RM3545 and 2 Ω for the RM3544.

High-speed, comprehensive productivity support

- The RM3545 and RM3544-01 deliver the speed demanded by automatic testing equipment at a sophisticated level. The entire process from the start of measurement to outputting of the judgment result takes as little as 2.2 ms \(^5\) (RM3545) and 18 ms (RM3544-01). One cycle of operation, lasting from measurement to judgment output, completes within this time.
- The instrument’s USB interface can also be used.
- The RM3545 and RM3544-01 support RS-232C data communications at up to 115.2 kbps \(^6\). The EXT I/O output mode can be switched between judgment mode and BCD mode.
- With some computers, large error components may prevent fast transfer speeds (baud rates) from being used. In this case, change the speed to a lower setting.

Handler (EXT I/O) interface

The handler interface (EXT I/O) is isolated from measurement circuitry, control circuitry, and the protective ground (chassis ground), providing a high level of noise resistance.

EXT I/O Input and Output Circuits

A switch on the rear panel is used to toggle the input signal polarity between NPN (sink output support) and PNP (source output support) settings depending on the PLC common polarity.

EXT I/O Signal List

RM3545

Input Signals:
- TRIG(IN0), CAL, KEY_LOCK, 0ADJ, PRINT(IN1), MUX, SCN_STEP, LOAD0 to LOAD5, BCD_LOW

Output Signals:
- [Judgment mode] EOM, ERR, INDEX, HI, LO, T_ERR, T_PASS,
- T_FAIL, BIN0 to BIN9, OB, OUT0 to OUT2
- [BCD mode] EOM, ERR, IN, HILO, BCDm_n, RNG_OUT0 to RNG_OUT3

RM3544-01

Input Signals:
- TRIG(IN0), KEY_LOCK, 0ADJ, PRINT(IN1), LOAD0 to LOAD3, BCD_LOW

Output Signals:
- [Judgment mode] EOM, ERR, INDEX, HI, IN, LO, OUT0 to OUT2
- [BCD mode] EOM, ERR, IN, HILO, BCDm_n, RNG_OUT0 to RNG_OUT3

Communications Monitor Function for smooth systems development

When designing a control system using the EXT I/O interface, be sure to read the instruction manual and check the necessary technical information.

EXT I/O Electrical Specifications

- **Inputs:**
  - Photocoupler isolation: Non-voltage contact inputs (support for current sink output)
  - Input ON: Residual voltage: Max. 1 V @ 4 mA
  - Input OFF: Open Max. 100 μA
- **Outputs:**
  - Photocoupler-isolated open drain output (no-polarity)
  - DC30V max, DC50mA max/ch
  - Residual voltage: Max. 1 V @ 50 mA, or 0.5 V @ 10 mA
- **External power output:**
  - Output voltage: Sink output support: 5.0V±10%, Source output support: -5.0V±10%
  - Max. output current: 100mA

Communications Monitor Function for verifying the EXT I/O connection status and testing EXT I/O

In addition to allowing you to check EXT I/O signal input on the instrument’s screen, this functionality allows you to turn output signals on or off as desired. This capability simplifies verification work during PLC programming.
Connecting the instrument to a computer via RS-232C or USB

- Use a PC to control RM3545 and RM3544-01 functions as well as acquire measurement results. (This capability does not include turning the instrument on and off or configuring certain interface settings.)
- Connect the instrument to a commercially available RS-232C printer to print measured values, including judgment results.
- Measured values can be automatically output. By using the instrument’s USB keyboard mode, measured values can be entered into applications such as spreadsheets and text editors without the need to install a special USB driver in the computer.
- The sample PC application provides functionality for capturing data based on trigger signals, performing interval measurement, conducting communication tests, and loading captured data into Microsoft® Excel or outputting it as a CSV file. The application can be downloaded from Hioki’s website (http://www.hioki.com).

Multiplexer Units cannot be installed in the RM3545 or RM3545-01. The RM3545-01 has a GP-IB connector.

Interface and EXT I/O selection

Select the interfaces and EXT I/O capability needed for your application.

<table>
<thead>
<tr>
<th>RM3545 series comparison chart</th>
<th>[Base model]</th>
<th>-01</th>
<th>-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>External I/O (comparator, BCD, BIN function)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Communication interfaces</td>
<td>RS-232C/Printer/USB</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Multiplexer* (scanner function)</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*When using 4-terminal measurement with two MULTIPLEXER UNIT Z3003 (option) cards.

<table>
<thead>
<tr>
<th>RM3544 series comparison chart</th>
<th>[Base model]</th>
<th>-01</th>
</tr>
</thead>
<tbody>
<tr>
<td>External I/O (comparator, BCD)</td>
<td>N/A</td>
<td>✓</td>
</tr>
<tr>
<td>Communication interfaces</td>
<td>RS-232C/Printer/USB</td>
<td>N/A</td>
</tr>
</tbody>
</table>

MULTIPLEXER UNIT Z3003 Specifications

- Measurement targets:
  - 4-wire: 10 locations (when using 2 units, 20 locations)
  - 2-wire: 21 locations (when using 2 units, 42 locations)
- Measurable range:
  - [Measurement current] Internal instrument: 1A DC or less
  - External instrument: 1A DC or less, 100 mA AC or less
- Contact specifications:
  - Internal instrument: 1A DC, 10 Hz to 1 kHz
  - Maximum allowable voltage: 33 V RMS and 46.7 V peak or 70 V DC
  - Maximum allowable power: 30 W (DC), (Resistance load)
  - Contact service life: 4-wire: 50 million cycles (reference value)
  - 2-wire: 5 million cycles (reference value)
- Dimensions:
  - Approx. 92W × 24.5H × 182D mm (3.62"W × 0.96"H × 7.17"D) (without projections)
- Mass:
  - Approx. 180 g (6.3 oz)
- Accessories:
  - Instruction manual × 1, D-SUB 50pin connector × 1

Product warranty: 1 year

About scanning time

The Z3003 scanning time is 30 ms/ch. The total scanning time can be calculated as follows: (Switching time + measurement time including delay) × number of channels
For measurement time typical values, please see page 11.

<table>
<thead>
<tr>
<th>Example scanning times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
</tr>
<tr>
<td>1000nΩ</td>
</tr>
<tr>
<td>1000nΩ</td>
</tr>
</tbody>
</table>

*1 Cannot be used in combination with a withstand voltage tester. When used with a withstand voltage tester, the Z3003’s internal relay will cause an insulation breakdown, resulting in electric shock or equipment damage.

*2 Assuming 24-hour operation, the guideline of 50 million cycles corresponds to approximately 1.5 years on a line operating at 1 sec. per workpiece or approximately 15 years on a line operating at 10 sec. per workpiece.
### RM3545/RM3544 Specifications

(Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year)

<table>
<thead>
<tr>
<th>RM3545</th>
<th>RM3544</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measurement types</strong></td>
<td></td>
</tr>
<tr>
<td>Resistance measurement: 0.000 0mΩ (10mΩ range) to 120.000 0Ω (1000Ω range), 12 ranges</td>
<td>Resistance measurement: 0.000mΩ (30mΩ range) to 3.500 0MΩ (3MΩ range), 9 ranges</td>
</tr>
<tr>
<td>Low power resistance measurement: 0.000mΩ (1000mΩ range) to 120.000Ω (1000Ω range), 4 ranges</td>
<td>Temperature measurement (thermistor): -10.0 to 99.9°C</td>
</tr>
<tr>
<td>Temperature measurement (thermistor): -10.0 to 99.9°C</td>
<td>Temperature measurement (thermistor): -10.0 to 99.9°C</td>
</tr>
<tr>
<td>Temperature measurement (analog input): -99.9 to 9999.9°C</td>
<td></td>
</tr>
<tr>
<td><strong>Measurement method</strong></td>
<td></td>
</tr>
<tr>
<td>4-terminal direct current (constant current), banana plug, with guard terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Range switching</strong></td>
<td>Auto or Manual</td>
</tr>
<tr>
<td><strong>Temperature correction</strong></td>
<td></td>
</tr>
<tr>
<td>Reference temperature setting range: -10°C to 99.9°C</td>
<td>Reference temperature setting range: -10°C to 99.9°C</td>
</tr>
<tr>
<td>Temperature coefficient setting range: -9999 pppm/°C to 99999 pppm/°C</td>
<td>Temperature coefficient setting range: -9999 pppm/°C to 99999 pppm/°C</td>
</tr>
<tr>
<td><strong>Zero-adjustment</strong></td>
<td></td>
</tr>
<tr>
<td>By range, by step (RM3545-02 only)</td>
<td>By range, by step (RM3544-02 only)</td>
</tr>
<tr>
<td>Within ±50% f.s. of each range. (Zero-adjustment is not required for 100 MΩ or greater ranges.)</td>
<td>Within ±3% to ±50% f.s. of each range. (f.s. = 30,000 dgt.)</td>
</tr>
<tr>
<td><strong>Trigger</strong></td>
<td>Internal or external</td>
</tr>
<tr>
<td><strong>Measurement speed</strong></td>
<td></td>
</tr>
<tr>
<td>FAST / MED / SLOW1 / SLOW2</td>
<td>FAST / MED / SLOW</td>
</tr>
<tr>
<td><strong>Delay</strong></td>
<td>Internal fixed value: 0 to 9999 ms (1ms step) N/A</td>
</tr>
<tr>
<td><strong>Functions</strong></td>
<td>Temperature correction, comparator (ABS/REF%), key-lock (OFF, menu lock, all lock), display digit count selection function (7 digits/6 digits/5 digits), automatic power supply frequency settings (AUTO/50Hz/60Hz), scaling, judgment sound setting, auto hold, statistical calculations, clock, self-test, L2105 LED Comparator Attachment output</td>
</tr>
<tr>
<td><strong>Measurement fault detection functions</strong></td>
<td>Contact check, over detection, current fault detection</td>
</tr>
<tr>
<td><strong>Averaging</strong></td>
<td>OFF, 2 to 100 averaging iterations (variable in 1-iteration steps)</td>
</tr>
<tr>
<td><strong>Panel store, panel load</strong></td>
<td></td>
</tr>
<tr>
<td>30 (Front terminals), 8 (MUX/multiplexer)</td>
<td>10</td>
</tr>
<tr>
<td>Panel save parameters: save time and date, resistance measurement ranges, measurement speed, comparator, BIN setting, multiplexer setting, etc.</td>
<td>Panel save parameters: resistance measurement ranges, measurement speed, comparator, etc.</td>
</tr>
<tr>
<td><strong>Multiplexer</strong></td>
<td></td>
</tr>
<tr>
<td>RM3545-02: Number of installed units: Max. 2</td>
<td>N/A</td>
</tr>
<tr>
<td>Measurement terminal settings: Front terminals / MUX (multiplexer)</td>
<td></td>
</tr>
<tr>
<td>When using the MUX setting, the measurement leads cannot be connected to the front measurement terminals</td>
<td></td>
</tr>
<tr>
<td>Support unit: Z3003</td>
<td></td>
</tr>
<tr>
<td>Number of channels that can be set: 42, switching time 30 ms (reference value)</td>
<td></td>
</tr>
<tr>
<td><strong>D/A output</strong></td>
<td></td>
</tr>
<tr>
<td>Output: resistance measured value</td>
<td></td>
</tr>
<tr>
<td>Output voltage: 0V DC to 1.5V DC</td>
<td></td>
</tr>
<tr>
<td>Output impedance: 1kΩ</td>
<td></td>
</tr>
<tr>
<td><strong>Communication interfaces</strong></td>
<td></td>
</tr>
<tr>
<td>Select from RS-232C, PRINTER(RS-232C), or USB</td>
<td>Select from RS-232C, PRINTER(RS-232C), or USB</td>
</tr>
<tr>
<td>Select from GP-IB, PRINTER(RS-232C), or USB</td>
<td>Select from GP-IB, PRINTER(RS-232C), or USB</td>
</tr>
<tr>
<td><strong>Printer (RS-232 port)</strong></td>
<td></td>
</tr>
<tr>
<td>Printed data: Resistance measurement values, temperature measurement values, judgment results, measurement conditions, statistical results</td>
<td>Printed data: Resistance measurement values, temperature measurement values, judgment results, measurement conditions</td>
</tr>
<tr>
<td>Operation: Prints at PRINT signal or PRINT key input. Interval: ON/OFF, Interval times: 1 to 3600 s (variable in 1 s steps), Number of print columns per row: 1 or 3</td>
<td></td>
</tr>
<tr>
<td><strong>Operating environment</strong></td>
<td></td>
</tr>
<tr>
<td>Indoors, Pollution Degree 2, up to 2000 m ASL</td>
<td></td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td></td>
</tr>
<tr>
<td>Rated supply voltage: 100 to 240 VAC ±10%, Rated supply frequency: 50/60 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>Rated power consumption</strong></td>
<td></td>
</tr>
<tr>
<td>40 VA</td>
<td>15 VA</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td></td>
</tr>
<tr>
<td>Approx. 215W × 80H × 306.5D mm (8.46”W × 3.15”H × 12.07”D) (without projections)</td>
<td>Approx. 215W × 80H × 166D mm (8.46”W × 3.15”H × 6.54”D) (without projections)</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td></td>
</tr>
<tr>
<td>RM3545, RM3545-01: Approx. 2.5 kg (88.2 oz)</td>
<td>RM3544: Approx. 0.9 kg (31.7 oz)</td>
</tr>
<tr>
<td>RM3545-02: Approx. 3.2 kg (112.9 oz) (not including Z3003)</td>
<td>RM3544-02: Approx. 1.0 kg (35.3 oz)</td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td></td>
</tr>
<tr>
<td>Power cord × 1, CLIP TYPE LEAD L2101 × 1, temperature sensor Z2001 × 1, male EXT/I/O connector × 1, instruction manual × 1, application disc × 1, USB cable (A-to-B type) × 1, spare fuse × 1</td>
<td>Power cord × 1, CLIP TYPE LEAD L2101 × 1, male EXT/I/O connector × 1, instruction manual × 1, application disc × 1, USB cable (A-to-B type) × 1, spare fuse × 1</td>
</tr>
<tr>
<td>Included with RM3544-01.</td>
<td></td>
</tr>
<tr>
<td><strong>Applicable standards</strong></td>
<td>Safety: EN61010, EMC: EN61326, EN61000-3-2, EN61000-3-3</td>
</tr>
</tbody>
</table>

- **TRIG and other, BIN, BCD D/A output**
- **Auto or Manual Range switching**
- **Reference temperature setting range: -10ºC to 99.9ºC**
- **Temperature coefficient setting range: -9999 ppm/°C to 99999 ppm/°C**
- **RM3544: Internal trigger, RM3544-02: Internal or external Trigger**
- **FAST / MED / SLOW1 / SLOW2 Measurement speed**
- **0 to 9999 ms (1ms step) Delay**
- **N/A Functions**
- **N/A Measurement fault detection functions**
- **OFF, 2 to 100 averaging iterations (variable in 1-iteration steps) Averaging**
- **30 (Front terminals), 8 (MUX/multiplexer) Panel store, panel load**
- **N/A Multiplexer**
- **N/A D/A output**
- **RM3544-01: TRIG and other, BCD Communication interfaces**
- **Remote function, communications monitor function, data output function, memory (50 data) Communication interfaces**
- **0 to 40ºC, 80% rh or less (non-condensing) Operating temperature and humidity**
- **−10 to 50ºC, 80% rh or less (non-condensing) Storage temperature and humidity**
- **Indoors, Pollution Degree 2, up to 2000 m ASL Operating environment**
- **1.62 kV AC for 1 min. (with 10 mA cutoff current), between all mains supply terminals and protective ground, interfaces, and measurement terminals Insulation withstand potential**
- **Approx. 215W × 80H × 306.5D mm (8.46”W × 3.15”H × 12.07”D) (without projections) Dimensions**
- **Approx. 2.5 kg (88.2 oz) Mass**
- **1.0 kg (35.3 oz) Accessories**
- **Safety: EN61010, EMC: EN61326, EN61000-3-2, EN61000-3-3 Applicable standards**
### Measurement accuracy

**Conditions of guaranteed accuracy**
- Temperature & humidity: 23 °C ±5 °C, 80% rh or less (non-condensing)
- From 0°C to 18°C and from 28°C to 40°C, add (temperature coefficient ±1/10 measurement accuracy) / °C.
- Guaranteed Accuracy Period: 1 year
- **RM3545** only: Warmup time of 60 min. or greater (If less than 60 min., double figures in the accuracy table to obtain the measurement accuracy.)
- **RM3545** only: self-calibration AUTO

*When using manual self-calibration, temperature fluctuations after performing calibration must be within ±2°C, and the calibration interval must be within 30 min.*

#### Resistance measurement accuracy

**RM3545**

Accuracy = ±( % rdg. + % f.s.)

LP OFF

- f.s. = calculated 1,000,000 dgt., where 0.001% f.s. = 10 dgt.
- For 100 MΩ and greater ranges with 100 MΩ range high-precision mode off, calculate as f.s. = 1,000,000 dgt., where 0.001% f.s. = 1 dgt.

<table>
<thead>
<tr>
<th>Range</th>
<th>100MΩ range high-precision mode</th>
<th>Max. measurement display</th>
<th>Resolution</th>
<th>Accuracy</th>
<th>%rdg. + %f.s.</th>
<th>Measurement current</th>
<th>Additional accuracy without 0ADJ</th>
<th>Max open-terminal voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>10mΩ</td>
<td>10.000 0 Ω</td>
<td>10 μΩ</td>
<td>FAST</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MED</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SLOW1</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SLOW2</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Switching</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

**RM3544**

<table>
<thead>
<tr>
<th>Range</th>
<th>100MΩ range high-precision mode</th>
<th>Max. measurement display</th>
<th>Resolution</th>
<th>Accuracy</th>
<th>%rdg. + %f.s.</th>
<th>Measurement current</th>
<th>Additional accuracy without 0ADJ</th>
<th>Max open-terminal voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>10mΩ</td>
<td>10.000 0 Ω</td>
<td>10 μΩ</td>
<td>FAST</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MED</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SLOW1</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SLOW2</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>0.060 ±0.02 (0.006 +0.000)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Switching</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

### Notes

1. For negative values, to -10% f.s. The maximum display range is 9,999,999 dgt. or 9 GΩ. (An over-range error will be indicated when the maximum measurement range is exceeded, even if the maximum display range is not exceeded.)
2. Measurement accuracy figures reflect accuracy after zero-adjustment. If not performing zero-adjustment, add the figures shown in the “Additional accuracy without 0ADJ” column.
3. Measurement current accuracy is ±5%.
4. When using an external trigger source or performing measurement with continuous measurement set to off (other than free-run), the open-circuit voltage from 1 ms after the completion of measurement (INDEX = ON) to the start of the next measurement (TRIG = ON) is limited to 20 mV or less.

LP ON

- f.s. = calculated 100,000 dgt., where 0.001% f.s. = 1 dgt.

<table>
<thead>
<tr>
<th>Range</th>
<th>100MΩ range high-precision mode</th>
<th>Max. measurement display</th>
<th>Resolution</th>
<th>Accuracy</th>
<th>%rdg. + %f.s.</th>
<th>Measurement current</th>
<th>Additional accuracy without 0ADJ</th>
<th>Max open-terminal voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000mΩ</td>
<td>1000.000 Ω</td>
<td>10 nΩ</td>
<td>FAST</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MED</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SLOW1</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SLOW2</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>0.200 ±0.01 (0.020 +0.002)</td>
<td>–</td>
<td>1 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Switching</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

### Notes

1. For negative values, to -10% f.s. The maximum display range is 9,999,999 dgt. or 9 GΩ. (An over-range error will be indicated when the maximum measurement range is exceeded, even if the maximum display range is not exceeded.)
2. Measurement accuracy figures reflect accuracy after zero-adjustment. LP values apply only when OVC is on.
3. Measurement current accuracy is ±5%.
4. When the contact check function is off (when the contact check function is on, 300 mV)
● Additional accuracy when using the Z3003

When performing measurements using the Z3003, the following uncertainties are added to the RM3545 specifications (accuracy):

### Z3003 additional error

- **Effects of leak current**
  - Read a reading error shown on right depending on the measurement current when using guarding: (With humidity of less than 70% RH. If the humidity is greater than or equal to 70% RH, add the following rdg. error × 5.):
  
  \[
  I_{\text{MEAS}} = 1 \times 10^{-6} [\text{A}] \times 100 \times \text{rdg.} \]

- **Effect of measurement speed**
  - Add the f.s. error component shown on right when the integration time is not a whole-number multiple of the power supply cycle:
  \[
  A_s \times 0.5 \times \text{rdg.} \]

- **Effect of offset voltage**
  - Add the resistance shown on right to the error when OVC is OFF:
  \[
  10 \times 10^{-9} [\text{V}] \times [\text{A}] \times 100 \times \text{I}_{\text{MEAS}} \]

- **Effect of offset resistance fluctuations**
  - When using a 2-wire setup, add the wiring resistance shown on right to the error component:

\[
0.1 \Omega
\]

- **Temperature coefficient**
  - From 0°C to 18°C and 28°C to 40°C, add a temperature coefficient of ±(1/10 of additional accuracy) / °C.

### RM3544

**Accuracy** = ± (% rdg. + % f.s.)
- f.s. = calculated 30,000 dgt., where 0.010% f.s. = 3 dgt.

**Range**

<table>
<thead>
<tr>
<th>Measurement current display*6</th>
<th>FAST</th>
<th>MED/SLOW</th>
<th>Measurement current</th>
<th>Open-Circuit Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>30mΩ</td>
<td>35.000 mΩ</td>
<td>0.030+0.080</td>
<td>0.030+0.070</td>
<td>300mA</td>
</tr>
<tr>
<td>300mΩ</td>
<td>350.000 mΩ</td>
<td>0.025+0.017</td>
<td>0.025+0.014</td>
<td>30mA</td>
</tr>
<tr>
<td>3Ω</td>
<td>3.500 Ω</td>
<td>0.025+0.017</td>
<td>0.025+0.014</td>
<td>30mA</td>
</tr>
<tr>
<td>30Ω</td>
<td>35.000 Ω</td>
<td>0.020+0.010</td>
<td>0.020+0.007</td>
<td>10mA</td>
</tr>
<tr>
<td>300Ω</td>
<td>350.000 Ω</td>
<td>0.020+0.010</td>
<td>0.020+0.007</td>
<td>10mA</td>
</tr>
<tr>
<td>3kΩ</td>
<td>3.500 kΩ</td>
<td>0.020+0.010</td>
<td>0.020+0.007</td>
<td>100μA</td>
</tr>
<tr>
<td>30kΩ</td>
<td>35.000 kΩ</td>
<td>0.040+0.010</td>
<td>0.040+0.007</td>
<td>5μA</td>
</tr>
<tr>
<td>3MΩ</td>
<td>3.500 MΩ</td>
<td>0.200+0.010</td>
<td>0.200+0.007</td>
<td>500mA</td>
</tr>
</tbody>
</table>

*6 For negative values, to -10% f.s.

*7 The maximum display range is 99,999dgt.

**Analog Input** (for RM3545)

- **Guaranteed accuracy range**
  - 0 to 2 V
- **Maximum allowable voltage**
  - 2.5V
- **Resolution**
  - 1mV
- **Display range**
  - -99.9 to 999.9 ºC
- **Measurement period (speed)**
  - Approx. 50 ms, no moving average
- **Guaranteed accuracy period**
  - 1 year
- **Accuracy**
  - ±1% rdg. ±3 mV

**Temperature Sensor Z2001** (for RM3544/RM3544-01)

**Range of guaranteed accuracy**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10.0 °C to 9.9 °C</td>
<td>± (0.55 + 0.009 ×</td>
</tr>
<tr>
<td>10.0 °C to 30.0 °C</td>
<td>± 0.50 °C</td>
</tr>
<tr>
<td>30.1 °C to 59.9 °C</td>
<td>± (0.55 + 0.012 ×</td>
</tr>
<tr>
<td>60.0 °C to 99.9 °C</td>
<td>± (0.92 + 0.021 ×</td>
</tr>
</tbody>
</table>

Standalone instrument accuracy: ±0.2 °C

**Display refresh rate**

Approx. 2 s

**Guaranteed accuracy period**

1 year

**Temperature Sensor Z2001 and RM3545/RM3544/RM3544-01 combined accuracy**

- Standalone instrument accuracy: ±0.2 °C

**Range**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10.0 °C to 9.9 °C</td>
<td>± (0.55 + 0.009 ×</td>
</tr>
<tr>
<td>10.0 °C to 30.0 °C</td>
<td>± 0.50 °C</td>
</tr>
<tr>
<td>30.1 °C to 59.9 °C</td>
<td>± (0.55 + 0.012 ×</td>
</tr>
<tr>
<td>60.0 °C to 99.9 °C</td>
<td>± (0.92 + 0.021 ×</td>
</tr>
</tbody>
</table>

**Measurement time typical values (RM3545)**

<table>
<thead>
<tr>
<th>Range</th>
<th>Measurement current</th>
<th>Measurement speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mΩ</td>
<td>N/A</td>
<td>41 61 58 141 241</td>
</tr>
<tr>
<td>100 mΩ</td>
<td>High</td>
<td>41 61 58 141 241</td>
</tr>
<tr>
<td>1000 mΩ</td>
<td>High</td>
<td>2.2 22 19 102 202</td>
</tr>
<tr>
<td>10 Ω</td>
<td>High</td>
<td>2.2 22 19 102 202</td>
</tr>
<tr>
<td>100 Ω</td>
<td>High</td>
<td>2.8 23 20 103 203</td>
</tr>
</tbody>
</table>

**Measurement time (RM3544)**

<table>
<thead>
<tr>
<th>Measurement speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAST</td>
</tr>
<tr>
<td>50Hz</td>
</tr>
<tr>
<td>21</td>
</tr>
<tr>
<td>401</td>
</tr>
</tbody>
</table>

Unit: ms, Tolerance: ±10% ±2 ms

* With TC set to ON and the comparator set to ON

---

* Shortest time when using an external trigger source or with continuous measurement off (other than free-run). With a delay of 10 ms, TC on, comparator on, OVC off, and averaging off. Measurement speed varies with the selected range and settings. For more information, please see the Instruction Manual.
# Model Configurations and Options

## Options

<table>
<thead>
<tr>
<th>Multiplexer Unit (for RM3545-02)</th>
<th>Test Leads</th>
<th>PC Communication</th>
<th>High-accuracy portable resistance meter measures from μΩ to MΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>MULTIPLEXER UNIT Z3003</td>
<td>Note on probe length</td>
<td>LED COMPARATOR ATTACHMENT L2105</td>
<td>- <strong>CLIP TYPE LEAD L2101</strong> 83 mm (3.27 in), L: 1.5 m (4.92 ft)</td>
</tr>
<tr>
<td></td>
<td><strong>(Whole image)</strong></td>
<td>2 m (6.6 ft)</td>
<td><strong>4-TERMINAL LEAD L2104</strong> 118 mm (4.65 in), L: 1.5 m (4.92 ft)</td>
</tr>
<tr>
<td>TEMPERATURE SENSOR Z2001</td>
<td>(RM3545:RM3545-01)</td>
<td>RS-232C CABLE 9637</td>
<td><strong>CLIP TYPE LEAD L2102</strong> 78 mm (3.07 in), L: 1.5 m (4.92 ft)</td>
</tr>
<tr>
<td></td>
<td>RM3545-02 Bundled accessory, RM3544:RM3544-01 (Option)</td>
<td>for PC connection, 9pin - 9pin, cross, 1.8 m (5.91 ft)</td>
<td><strong>PIN TYPE LEAD L2103</strong> 78 mm (3.07 in), L: 1.5 m (4.92 ft)</td>
</tr>
<tr>
<td>LED COMPARATOR ATTACHMENT L2105</td>
<td>1.75 m (5.74 ft)</td>
<td>RS-232C CABLE 9638</td>
<td><strong>PIN TYPE LEAD L2104</strong> 83 mm (3.27 in), L: 1.5 m (4.92 ft)</td>
</tr>
<tr>
<td></td>
<td>2 m (6.6 ft)</td>
<td>for PC connection, 9pin - 25pin, cross, 1.8 m (5.91 ft)</td>
<td><strong>RESISTANCE METER RM3548</strong> Basic accuracy: 0.02%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GP-IB CONNECTOR CABLE 9151-02</td>
<td>Max. resolution: 0.1μΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 m (6.6 ft)</td>
<td>Max. measurable current: 1A</td>
</tr>
</tbody>
</table>

## Related products

- Large motors, large transformers
- Vehicle grounding lines, conductivity of aircraft fuselages
- Temperature rise tests (Motors, choke coils, transformers)
- Large motors, large transformers
- Vehicle grounding lines, conductivity of aircraft fuselages
- Temperature rise tests (Motors, choke coils, transformers)

## Model: RESISTANCE METER RM3545

<table>
<thead>
<tr>
<th>Model No. (Order Code) (Note)</th>
<th>(with GP-IB interface)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM3545</td>
<td>(support for the multiplexer unit)</td>
</tr>
<tr>
<td>RM3545-01</td>
<td>Male EXT. I/O connector -1, Instruction manual -1, Application disc -1, USB cable (A-to-B type) -1, Spare fuse -1</td>
</tr>
<tr>
<td>RM3545-02</td>
<td>Male EXT. I/O connector -1, Instruction manual -1, Application disc -1, USB cable (A-to-B type) -1, Spare fuse -1</td>
</tr>
</tbody>
</table>

## Model: RESISTANCE METER RM3544

<table>
<thead>
<tr>
<th>Model No. (Order Code) (Note)</th>
<th>(No interfaces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM3544</td>
<td>(with EXT I/O, RS-232C, USB)</td>
</tr>
<tr>
<td>RM3544-01</td>
<td>Male EXT. I/O connector -1, Instruction manual -1, Application disc -1, USB cable (A-to-B type) -1, Spare fuse -1</td>
</tr>
</tbody>
</table>

---

**Caution when considering the use of probes without guard terminals**

Proper operation of the RM3545 and RM3544 is not guaranteed when using test leads (test probes) that lack guard terminals, for example test leads used with models such as the Resistance HiTester 3541 or μΩ HiTester 3540. Please use the test leads indicated in the RM3545 and RM3544 accessory and option documentation.

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**Model Configurations and Options**

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http://www.hiokiusa.com / E-mail: hioki@hiokiusa.com

**All information correct as of July 31, 2017. All specifications are subject to change without notice.**

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**Note:** Company names and Product names appearing in this catalog are trademarks or registered trademarks of various companies.

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**Resistor Specifications**

- **Basic accuracy:** 0.02%
- **Max. resolution:** 0.1μΩ
- **Max. measurable current:** 1A

- **Measure from 0.0 μΩ (@ 1 A) to 3.5 MΩ**
- **Easily record up to 1,000 data points in memory simply by applying the instrument’s probes.**
- **Smoothly capture temperature-rise test data using interval measurement.**
- **Portable design is ideal for maintenance and testing of large equipment.**

For more information, please visit [http://www.hioki.com](http://www.hioki.com).