3541 RESISTANCE HiTESTER
Components measuring instruments

Along with capabilities for fast, precise measurements over a broad resistance range, Model 3541 also provides functions for temperature correction, comparator and data I/O. Employing a four-terminal measurement method, this instrument is particularly suitable for measuring the resistance of motor and transformer windings, relay/switch and connector contacts, PCB patterns, chip inductor DC resistance and in shipping inspection tests.

0.1 μΩ (20 mΩ range) to 110,000 MΩ
Measure from very low (μΩ) to very high (MΩ) resistances with a single instrument

Along with capabilities for fast, precise measurements over a broad resistance range, Model 3541 also provides functions for temperature correction, comparator and data I/O. Employing a four-terminal measurement method, this instrument is particularly suitable for measuring the resistance of motor and transformer windings, relay/switch and connector contacts, PCB patterns, chip inductor DC resistance and in shipping inspection tests.
Wide Measurement Range
0.1 μΩ (20 mΩ range) to 110.000 MΩ

High Speed & High Precision Measurements
As fast as 0.6 ms with 70 ppm precision (in the 2 kΩ to 110 kΩ range)

Low-Power Measurement Function
Essential for DCR measurements of chip inductors and connector contacts

Comparator and BIN Functions
Fast PASS/FAIL judgments, and measurement value ranking in ten levels

Two Types of Temperature Correction
Correction by Pt sensor or infrared thermometer

Multipolar Connector
Low thermoelectromotive force supports high-speed measurements

Measurement Fault Detection
Enhanced measurement reliability by monitoring contact using all four leads

Temperature Conversion Function
Uses resistance to show temperature variations of measurement objects

Offset Voltage Compensation
Minimizes thermoelectromotive effects

Equipped with EXT I/O, GP-IB and RS-232C interfaces
Easily integrates into automated production lines

Statistical Calculation Functions
Use for process analysis and quality control

Stores up to 30 sets of measurement conditions
Measurement conditions can be changed quickly

Data Printing
Print out measurement values and calculation results (with optional Model 9670 Printer)
**Comparator**

Compares measurements with preset upper and lower limits, and displays and outputs the judged range of each measurement. Two setting methods are available: absolute value (upper/lower limit setting) and relative value (% of a reference value), and judgment results, indicated by Hi, IN or Lo LEDs and beeper, are also output via EXT I/O, RS-232C and GP-IB interfaces.

- **Judgments**
  - Hi: Display Value > Upper Limit, or OF
  - IN: Display Value between Upper and Lower Limits
  - Lo: Display Value is < Lower Limit, or -OF
- **Relative Value Judgment**
  - Display: \( \frac{\text{(Measured Resistance)} - \text{(Reference Value)}}{\text{(Reference Value)}} \)  
  -99.999% to 99.999%

- **Beeper**
  - OFF: Beeper does not sound
  - IN: Beeper sounds when the judgment result in IN
  - Hi/Lo: Beeper sounds when the judgment result is high or low

**Classify measurements in up to ten ranking BINs**

According to a preset range, measurements can be classified in up to ten ranks (BIN0 through BIN9). Settings are the same as for the comparator, using either absolute or relative values with results displayed and output to EXT I/O, RS-232C and GP-IB interfaces.

**Store up to 30 sets of measurement conditions**

Including settings for comparator and BIN measurements, up to 30 sets of measurement conditions can be stored and recalled by just selecting a setting number, so setting conditions can be changed quickly. Settings can also be accessed by remote control.

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**Excellent Stability**

Actual measurement results showing minimum dispersion

\[ \text{[ 20 m\Omega Range/SLOW2 ]} \]

\[ \text{[ 20 m\Omega Range/MEDIUM ]} \]

\[ \text{[ 200 \Omega Range/FAST & MEDIUM ]} \]

\[ \text{[ Low-Power Ohms: 2 W Range/FAST & MEDIUM ]} \]
Two types of temperature correction

Temperature correction functions regardless of materials and temperature

Using the 9451 Temperature Probe, resistance values measured at ambient temperature can be corrected by applying a thermal coefficient so that the display shows the corresponding resistance values at any other temperature.

Settings

For example, the resistance of a copper wire that measures 100 \( \Omega \) at 30ºC ambient can be corrected for display as the resistance it would have at 23ºC by applying the thermal coefficient (3930 ppm for copper when the conductivity ratio is 1), using the following settings.

Reference Temperature
Setting Range: –10 to 99.9ºC
Thermal Coefficient: –9999 to 9999 ppm

For proper correction, the measurement object must be at ambient temperature.

Temperature Correction by Analog Output (Infrared Thermometer)

Make temperature corrections by measuring the surface temperature of the measurement object using the analog output from an infrared thermometer, or through the RS-232C interface. Even when the measured object is not at ambient temperature, temperature correction can be applied. Actual temperature can be measured as well.

(When connecting the thermometer to the RS-232C interface, the GP-IB function is not available.)

Convenient Temperature Conversion Function for Motor Coil Verification

Temperature increase (\( \Delta t \)) is obtained and displayed by converting resistance measurements and ambient temperature. This function is especially useful for verifying motor windings or coils, where the maximum temperature increase needs to be determined when current is applied.

*The temperature conversion function cannot be used simultaneously with the temperature correction function.

1. When a motor or coil has thermally stabilized at room temperature, measure the resistance (\( r_c \)) and ambient temperature (\( t_0 \)) before applying current.
2. Excite the coil, and when the temperature increase appears to saturate, remove the excitation.
3. After removing excitation, determine the temperature (\( t_1 \) to \( t_n \)) from the resistance (\( r_t \)) measured at each specific time (\( t \)), and the ambient temperature.
4. Project the curve through the collected temperature data (\( t_1 \) to \( t_n \)) to estimate the maximum temperature increase (\( \Delta t \)).

For measurements unaffected by test leads or contact resistance -
Four-Terminal Resistance Measurements

With two-terminal measurements, the conductor resistance of the test leads and the contact resistance of the connections are included in the measured resistance, resulting in measurement errors. The four-terminal measurement method employs a very high input impedance voltmeter, whereby almost all measurement current is conducted through measured resistance \( R \). By measuring the voltage drop across only \( R \), its resistance is measured without being significantly affected by \( r_1 \) to \( r_4 \).

\[
R = \frac{E}{I_S}
\]

(Values \( r_1 \) through \( r_4 \) are the combined resistances of the test leads and contact resistances.)
To observe process conditions, the mean ($\bar{x}$), maximum (Max), minimum (Min) overall standard deviation ($s$), standard deviation of sample ($s$) and process productivity index ($C_p$: dispersion, $C_pK$: bias) can be calculated using up to the maximum of 30,000 measurement values. Measurement values, and those including judgment results and statistical calculation results can be printed using the optional Model 9670 Printer.  

Integrity of source and sensor leads and the constant-current supply are continually monitored to ensure measurements with high confidence. When a measurement fault is detected it is indicated on the instrument, and ERR is output from the EXT I/O interface.

Thermoelectromotive force occurs at the contact point of different metals. This force affects measurements, and if large enough, it can result in measurement errors. The offset voltage compensation function minimizes the effect of thermoelectromotive force to preserve measurement accuracy.

Consistent accuracy is maintained by automatic correction of internal circuit offset voltage and gain drift. Self-calibration is applied at every measurement using SLOW1/SLOW2 sampling, and every 30 minutes with FAST/MEDIUM sampling. Self-calibration is also performed at power on, and when measurement conditions are changed. (Self-calibration is enabled when AUTO is selected)

To observe process conditions, the mean ($\bar{x}$), maximum (Max), minimum (Min) overall standard deviation ($s$), standard deviation of sample ($s$) and process productivity index ($C_p$: dispersion, $C_pK$: bias) can be calculated using up to the maximum of 30,000 measurement values.

Measurement values can be averaged to minimize display instability. With Free Run selected, the display shows the moving average; otherwise, the display shows the average value over a period. The number of samples to average can be set from 2 to 100.

Consistent accuracy is maintained by automatic correction of internal circuit offset voltage and gain drift. Self-calibration is applied at every measurement using SLOW1/SLOW2 sampling, and every 30 minutes with FAST/MEDIUM sampling. Self-calibration is also performed at power on, and when measurement conditions are changed. (Self-calibration is enabled when AUTO is selected)

Printer operation requires Models 9638 RS-232C Cable and 9671 AC Adapter, and battery operation requires Models 9672 Battery Pack and 9673 Battery Charger.

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Print method: Thermal line dot
Print width: 72 mm
Print speed: 47.5 mm/s
Power: 9671 AC Adapter or 9672 Battery Pack
Dimensions: Approx. 199 x 77 x 174 mm
Mass: Approx. 500 g

Measurement Fault Detection

Offset Voltage Compensation

Self-Calibration

Statistical Calculation Functions

Data Printing

Interval Printing

Print out the elapsed time and measurement results in 1- to 3600-second intervals.

Multi-functional support for various applications

Multipolar Connector

Low Power Measurement

Average

Offset Voltage Compensation

Measurement Fault Detection

Self-Calibration

Statistical Calculation Functions

Data Printing

Interval Printing

Print out the elapsed time and measurement results in 1- to 3600-second intervals.

Printer operation requires Models 9638 RS-232C Cable and 9671 AC Adapter, and battery operation requires Models 9672 Battery Pack and 9673 Battery Charger.
Ideal for high-speed automated production lines

Starting measurement and loading measurement conditions can be externally controlled, and judgment results, BIN and BCD data can be output, providing easy incorporation in automated lines. General-purpose output is implemented by control of output signals using : IO : OUT commands.

<table>
<thead>
<tr>
<th>Transmission method</th>
<th>Transmission speed</th>
<th>Data length</th>
<th>Stop bits</th>
<th>Parity</th>
<th>Delimiters</th>
<th>Flow control</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232C</td>
<td>9600 bps</td>
<td>8 bits</td>
<td>1 bit</td>
<td>none</td>
<td>CR+LF for Tx, CR or CR+LF for Rx</td>
<td>Male 9-pin D-sub, with #4-40 attachment screws</td>
<td></td>
</tr>
</tbody>
</table>

**External Trigger Timing Chart**

- **t1:** ERR Output Response Time: 100 μs
- **t2:** Measurement Trigger Pulse Width: 100 μs (min.)
- **t3:** Delay Time: per setting
- **t4:** Input Time: depends on sampling rate, Offset Voltage Compensation on/off, average, delay and supply frequency (Fastest: 300 μs with FAST sampling and Offset Voltage Compensation Off)
- **t5:** Calculation Time: depends on calculation settings such as sampling rate and comparator (Fastest: 300 μs with FAST sampling)

**External Control by Personal Computer**

RS-232C and GP-IB interfaces are included as standard features. All functions other than the power switch can be controlled via these terminals.

(Except when connecting an infrared thermometer to the RS-232C interface.)

<table>
<thead>
<tr>
<th><strong>GP-IB</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SH1 : Supports all Source Handshake functions</td>
</tr>
<tr>
<td>AH1 : Supports all Acceptor Handshake functions</td>
</tr>
<tr>
<td>T6 : Supports Standard Talker functions</td>
</tr>
<tr>
<td>Supports Serial Poll functions</td>
</tr>
<tr>
<td>Talk-Only mode is not supported</td>
</tr>
<tr>
<td>Supports Talker Cancel function by MLA (My Talk Address)</td>
</tr>
<tr>
<td>L4 : Supports Standard Listener</td>
</tr>
<tr>
<td>Listen-Only mode not supported</td>
</tr>
<tr>
<td>Supports Listener Cancel function by MTA (My Talk Address)</td>
</tr>
<tr>
<td>SR1 : Supports all Service Request functions</td>
</tr>
<tr>
<td>RL1 : Supports all Remote/Local functions</td>
</tr>
<tr>
<td>PP0 : Parallel Poll function not supported</td>
</tr>
<tr>
<td>DC1 : Supports all Device Clear functions</td>
</tr>
<tr>
<td>DT1 : Supports all Device Trigger functions</td>
</tr>
<tr>
<td>C0 : Controller function not supported</td>
</tr>
<tr>
<td>Others: Compliant with IEEE 488.2</td>
</tr>
</tbody>
</table>

**RS-232C**

- **Transmission method:** Start/stop synchronization type, full duplex
- **Transmission speed:** 9600 bps
- **Data length:** 8 bits
- **Stop bits:** 1 bit
- **Parity:** none
- **Delimiters:** CR+LF for Tx, CR or CR+LF for Rx
- **Flow control:** none
- **Connector:** Male 9-pin D-sub, with #4-40 attachment screws

When connecting an infrared thermometer to the RS-232C interface, the GP-IB function is not available.
# Accuracy

## (1) Resistance Measurement

1-Year Accuracy (at 23±5°C)  
Accuracy: ±(ppm of rdg. + ppm of f.s.)

### Offset voltage compensation:

<table>
<thead>
<tr>
<th>Range</th>
<th>Maximum display value</th>
<th>Resolution</th>
<th>SLOW2</th>
<th>SLOW1</th>
<th>MEDIUM</th>
<th>FAST</th>
<th>Measurement Current</th>
<th>Open-Terminal Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mΩ</td>
<td>20.0000 mΩ</td>
<td>0.1 μΩ</td>
<td>1000 + 150</td>
<td>1000 + 170</td>
<td>1000 + 200</td>
<td>1000 + 250</td>
<td>1 A ± 5%</td>
<td>5 Vmax</td>
</tr>
<tr>
<td>200 mΩ</td>
<td>200.000 mΩ</td>
<td>1 μΩ</td>
<td>1000 + 10</td>
<td>1000 + 10</td>
<td>1000 + 10</td>
<td>1000 + 10</td>
<td>1 A ± 5%</td>
<td>5 Vmax</td>
</tr>
<tr>
<td>2 Ω</td>
<td>2000.00 mΩ</td>
<td>10 μΩ</td>
<td>140 + 40</td>
<td>140 + 40</td>
<td>140 + 40</td>
<td>140 + 150</td>
<td>100 mA ± 5%</td>
<td>2.6 Vmax</td>
</tr>
<tr>
<td>20 Ω</td>
<td>20.0000 Ω</td>
<td>100 μΩ</td>
<td>100 + 40</td>
<td>100 + 40</td>
<td>100 + 40</td>
<td>100 + 150</td>
<td>10 mA ± 5%</td>
<td>2.6 Vmax</td>
</tr>
<tr>
<td>200 Ω</td>
<td>200.000 Ω</td>
<td>1 m Ω</td>
<td>80 + 15</td>
<td>80 + 15</td>
<td>80 + 10</td>
<td>80 + 10</td>
<td>10 mA ± 5%</td>
<td>2.6 Vmax</td>
</tr>
<tr>
<td>2 kΩ</td>
<td>2000.00 Ω</td>
<td>10 m Ω</td>
<td>70 + 15</td>
<td>70 + 15</td>
<td>70 + 10</td>
<td>70 + 10</td>
<td>1 mA ± 5%</td>
<td>2.6 Vmax</td>
</tr>
<tr>
<td>20 kΩ</td>
<td>20.0000 kΩ</td>
<td>100 mΩ</td>
<td>70 + 10</td>
<td>70 + 10</td>
<td>70 + 10</td>
<td>70 + 10</td>
<td>100 μA ± 5%</td>
<td>2.6 Vmax</td>
</tr>
<tr>
<td>100 kΩ</td>
<td>110.000 kΩ</td>
<td>1 Ω</td>
<td>70 + 30</td>
<td>70 + 60</td>
<td>70 + 80</td>
<td>70 + 200</td>
<td>100 μA ± 5%</td>
<td>13 Vmax</td>
</tr>
<tr>
<td>1 MΩ</td>
<td>1100.000 MΩ</td>
<td>10 Ω</td>
<td>80 + 30</td>
<td>80 + 60</td>
<td>80 + 80</td>
<td>150 + 100</td>
<td>10 μA ± 5%</td>
<td>13 Vmax</td>
</tr>
<tr>
<td>10 MΩ</td>
<td>11.0000 MΩ</td>
<td>100 Ω</td>
<td>400 + 60</td>
<td>400 + 90</td>
<td>400 + 140</td>
<td>3000 + 200</td>
<td>1 μA ± 5%</td>
<td>13 Vmax</td>
</tr>
<tr>
<td>100 MΩ</td>
<td>110.000 MΩ</td>
<td>1 kΩ</td>
<td>2000 + 200</td>
<td>2000 + 230</td>
<td>2000 + 250</td>
<td>3000 + 300</td>
<td>100 nA ± 5%</td>
<td>13 Vmax</td>
</tr>
</tbody>
</table>

Note: 100 kΩ range and above are calculated as f.s. = 100,000 dgt.

### (2) Low-Power Resistance Measurements

1-Year Accuracy (at 23±5°C)  
Accuracy: ±(ppm of rdg. + ppm of f.s.)

### Offset voltage compensation:

<table>
<thead>
<tr>
<th>Range</th>
<th>Maximum display value</th>
<th>Resolution</th>
<th>SLOW2</th>
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<tr>
<td>2 Ω</td>
<td>2000.00 mΩ</td>
<td>10 μΩ</td>
<td>110 + 100</td>
<td>110 + 120</td>
<td>110 + 150</td>
<td>110 + 200</td>
<td>10 mA ± 5%</td>
<td>60 Vmax</td>
</tr>
<tr>
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<td>1 m Ω</td>
<td>110 + 100</td>
<td>110 + 120</td>
<td>110 + 150</td>
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</tr>
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<td>2 kΩ</td>
<td>2000.00 Ω</td>
<td>10 m Ω</td>
<td>110 + 100</td>
<td>110 + 100</td>
<td>110 + 100</td>
<td>110 + 100</td>
<td>10 μA ± 5%</td>
<td>60 Vmax</td>
</tr>
</tbody>
</table>

Note: Open-terminal voltage is limited to 20 mV or less from the time an external trigger causes INDEX = Hi until the next trigger input.

### Temperature Measurement

#### (1) Pt sensor (9451-Pt500, at 25°C)

- 1-Year Accuracy: ±0.5% rdg. ±0.8°C
- 6-Month Accuracy: ±0.3% rdg. ±0.5°C
- Resolution: 0.1°C

Accuracy is in combination with Model 9451 Temperature Probe.

#### (2) Analog Input (1-Year Accuracy)

<table>
<thead>
<tr>
<th>Input Range</th>
<th>Display</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 V to 2 V</td>
<td>-99.9 to 999.9°C</td>
<td>1 mV or better</td>
<td>±1% rdg. ±3 mV</td>
</tr>
</tbody>
</table>

*Conversion method temperature accuracy (Only 3541 instrument).

1% × (T - T r) + 0.3% × (T s - T r)

T r: Temperature at 1V input, T s: Temperature at 0V input, T = Current temp.

Add temperature coefficient (±0.1% rdg. ±0.3 mV/°C) to above accuracy for ambient temperature ranges 0 to 18 and 28 to 40°C.
### General Specifications

- **Operating temperature and humidity**: 0 to 40°C, 80% RH or less (non-condensating)
- **Storage temperature and humidity**: –10 to 40°C, 80% RH or less (non-condensating)
- **Guaranteed accuracy**: ±2% of full scale or ±5% of full scale (non-condensating)
- **Guaranteed accuracy temperature and humidity**: ±2% of full scale or ±5% of full scale (non-condensating)
- **Operating environment**: Indoors, 2000 m ASL or below
- **Rated supply voltage**: 100 to 240 VAC ±10%
- **Rated power consumption**: 30 VA
- **Insulation withstand potential**: 1.39 kVAC for 15s, with 10 mA cutoff current
- **Dimensions**: Approx. 215W × 90H × 295D mm (excluding projections)
- **Mass**: Approx. 2.6 kg

### Measurement

- **Measurement**: Four-terminal resistance measurement
- **Range**: 0.1 μΩ (20 μΩ range) to 110,000 MΩ
- **Low power four-terminal resistance measurement**: 10 μΩ (2 range) to 2.0000 kΩ
- **Temperature measurement (Pt)**: –10.0 to 99.9°C
- **Temperature measurement (analog)**: –10.0 to 99.9°C

### Functions

- **Temperature correction**, **temperature conversion**, **self calibration**, **measurement fault detection**, **overflow detection**, **offset voltage compensation**, **average**, **statistical calculation**, **key lock**, **save/load**, **comparator**, **BIN measurement**

### Accessories

- **9287-10 CLIP TYPE LEAD**, **9451 TEMPERATURE PROBE**, **Power Cord**, **EXT I/O Male Connector**

### Applicable Standards

- **Safety**: EN61010-1:2001
- **Power supply Overvoltage Category II 300 V (Anticipated overvoltage 2.5 kV)**: EMI
- **EN61000-3-2:2000**
- **EN61000-3-3:1995+A2:2001**
  - Effect of radiated radio frequency electromagnetic fields: 1% f.s.
  - Effect of conducted radio frequency electromagnetic fields: 1% f.s.

### Sampling (Resistance and Low Power Resistance measurements)

- **Measurement time (from trigger until EOC=ON) [ms]**
  - **Supply Frequency** | **SLOW2** | **SLOW1** | **MEDIUM** | **FAST**
  - **50Hz** | 455 ±10 | 155 ±5 | 21 ±1 | 0.6 ±0.3
  - **60Hz** | 449 ±10 | 149 ±5 | 17 ±1 | 0.6 ±0.3

### Sampling (Resistance and Low Power Resistance measurements)

- **Acquisition time (from INDEX = OFF to INDEX = ON) [ms]**
  - **Supply Frequency** | **SLOW2** | **SLOW1** | **MEDIUM** | **FAST**
  - **50Hz** | 400 ±10 | 100 ±5 | 20.0 ±1 | 0.30 ±0.1
  - **60Hz** | 395 ±10 | 100 ±5 | 16.7 ±1 | 0.30 ±0.1

### Temperature Measurement: Measurement Cycle

- **400 ±10 ms**

### Delay [ms] [AUTO] [OVC: Offset Voltage Compensation]

### Resistance Measurement

<table>
<thead>
<tr>
<th>Range [Ω]</th>
<th>20m</th>
<th>200m</th>
<th>2 to 20k</th>
<th>100k</th>
<th>1M</th>
<th>10M</th>
<th>100M</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVC OFF</td>
<td>30</td>
<td>3</td>
<td>10</td>
<td>100</td>
<td>500</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>OVC ON</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Low Power Mode

- **Delay setting**: 0.000 to 9999 s

### Sampling

- **Sampling (Resistance and Low Power Resistance measurements)**
  - **Supply Frequency** | **SLOW2** | **SLOW1** | **MEDIUM** | **FAST**
  - **50Hz** | 455 ±10 | 155 ±5 | 21 ±1 | 0.6 ±0.3
  - **60Hz** | 449 ±10 | 149 ±5 | 17 ±1 | 0.6 ±0.3

### Acquisition time (from INDEX = OFF to INDEX = ON) [ms]

- **Supply Frequency** | **SLOW2** | **SLOW1** | **MEDIUM** | **FAST**
- **50Hz** | 400 ±10 | 100 ±5 | 20.0 ±1 | 0.30 ±0.1
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### Temperature Measurement: Measurement Cycle

- **400 ±10 ms**

### Delay [ms] [AUTO] [OVC: Offset Voltage Compensation]

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<tr>
<td>OVC OFF</td>
<td>30</td>
<td>3</td>
<td>10</td>
<td>100</td>
<td>500</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>OVC ON</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
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### Low Power Mode

- **Delay setting**: 0.000 to 9999 s

### Accessories

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  - Effect of radiated radio frequency electromagnetic fields: 1% f.s.
  - Effect of conducted radio frequency electromagnetic fields: 1% f.s.

### Sampling (Resistance and Low Power Resistance measurements)

- **Supply Frequency** | **SLOW2** | **SLOW1** | **MEDIUM** | **FAST**
- **50Hz** | 455 ±10 | 155 ±5 | 21 ±1 | 0.6 ±0.3
- **60Hz** | 449 ±10 | 149 ±5 | 17 ±1 | 0.6 ±0.3

### Acquisition time (from INDEX = OFF to INDEX = ON) [ms]

- **Supply Frequency** | **SLOW2** | **SLOW1** | **MEDIUM** | **FAST**
- **50Hz** | 400 ±10 | 100 ±5 | 20.0 ±1 | 0.30 ±0.1
- **60Hz** | 395 ±10 | 100 ±5 | 16.7 ±1 | 0.30 ±0.1

### Temperature Measurement: Measurement Cycle

- **400 ±10 ms**

### Delay [ms] [AUTO] [OVC: Offset Voltage Compensation]

### Resistance Measurement

<table>
<thead>
<tr>
<th>Range [Ω]</th>
<th>20m</th>
<th>200m</th>
<th>2 to 20k</th>
<th>100k</th>
<th>1M</th>
<th>10M</th>
<th>100M</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVC OFF</td>
<td>30</td>
<td>3</td>
<td>10</td>
<td>100</td>
<td>500</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>OVC ON</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Low Power Mode

- **Delay setting**: 0.000 to 9999 s

### Accessories

- **9287-10 CLIP TYPE LEAD**, **9451 TEMPERATURE PROBE**, **Power Cord**, **EXT I/O Male Connector**

### Applicable Standards

- **Safety**: EN61010-1:2001
- **Power supply Overvoltage Category II 300 V (Anticipated overvoltage 2.5 kV)**: EMI
- **EN61000-3-2:2000**
- **EN61000-3-3:1995+A2:2001**
  - Effect of radiated radio frequency electromagnetic fields: 1% f.s.
  - Effect of conducted radio frequency electromagnetic fields: 0.5% f.s.