Contact resistance meter with high-speed response
Meeting measurement requirements from contact resistance to internal resistance and voltage of batteries.

This contact resistance meter complete with comparator function and external interface utilizes the principles of the AC 4-terminal method that gives priority to line use and allows measurement offering high speed, high accuracy and high resolution.

External output terminal, external control terminal and RS-232C interface are standard features. GP-IB interface and printer interface are optionally available. The instrument also features an Ω and V mode that offers simultaneous measurement and comparison of battery internal resistance and open-circuit voltage, making it highly suitable for battery inspection lines as one unit can act as both a low-resistance meter and DMM.
Rapid response time - approximately 84 ms (60 Hz)

Features

- Fast measurement and fast quality determination
  In the FAST mode, the instrument performs lightning fast measurements at 60 times/sec with a response time of about 84 ms (at 60 Hz) to reduce the line tact time. This helps increase mass-production efficiency. The comparator has memory for 30 configuration tables which enables one unit to perform quality determination of many measurement objects all having different characteristics.

- Low-power resistance measurement
  Conduct low power resistance measurements according to the IEC 512-2 standard. Accurately measure contact resistance without destroying the oxide film on contact surfaces of components such as relays and connectors.

- Battery measurement
  Since DC voltage measuring can be performed simultaneously, the 3560 can also be applied to measure open-circuit voltage of batteries. One unit can measure both internal resistance and open-circuit voltage for complex quality evaluation. Furthermore, using the voltage limiter OFF function enables even more stable measurement of battery internal resistance.

- High-resolution measuring
  High-resolution measurement of 1 µΩ in the 30 mΩ range.

- Sense check function for prevention of erroneous measurements
  Earlier instruments only perform sense check on the source side, but the 3560 unit also conducts a check on the sense side to guarantee against erroneous measuring and wrong evaluation.

- PC interfaces
  RS-232C interface and external control terminal are standard features. Printer interface and GB-IP interface are available as options.

- Comfortable operation
  The number of switch operations has been reduced to achieve simple and intuitive operation.

- Versatile array of leads
  A wide selection of test leads, such as clip leads, pin leads and 4-terminal leads, are available, allowing you to select the most suitable type for the component to be measured.

 Comparator Function

Two settings are available in the resistance measurement mode: the upper limit and lower limit value settings. In the low-resistance and voltage measurement mode, the upper limit and lower limit value settings can be made separately for the two measurement items. When both are determined as IN, PASS is indicated, in other cases FAIL is indicated. In addition to the Hi/IN/Lo and PASS/FAIL indications, the results can also be signaled by a buzzer and output via an open-collector output.

Up to 30 comparator configuration tables can be memorized, each storing settings for a measurement mode, measurement range, upper and lower limit values and a buzzer mode.

Intuitive Operation Interface

1. HOLD button (press to hold the measurement value on the display, as well as to control measurement using the trigger)
2. VIEW button (press to check comparator conditions using a one-touch operation, as well as to set the power supply frequency)
3. EXEC button (executes zero adjustment and switches the buzzer ON/OFF)
4. COMP button (press to switch the comparator ON/OFF, as well as to enter condition setting mode)
5. COMP No. button (press to select the comparator table and result output trigger)
6. Clearly visible display employing fluorescence display tube
7. Raises the range and switches the voltage range, and switches the sensing function ON/OFF
8. Switches the voltage range, and the sense check function ON/OFF
9. External hold terminal

Comparator setting example

Resistance range 300 mΩ (upper limit value 180.00 mΩ/lower limit value 170.00 mΩ), voltage range 5 V (upper limit value 3.8000 V/lower limit value 3.5000 V), Table No.1, buzzer set to sound for PASS.
High-Speed Measurement Contributing to Super Efficient Production Lines

## Designed for System Use

Utilize the built-in external control terminal to select the comparator table, as trigger and for requesting printout, etc. The external output can be used for output of comparator results, measurement completion (EOC) and NG output. These external input and output capabilities have been designed with systems integration in mind.

### Timing Chart Example

The following shows a timing example for reading out the comparator results using the HOLD function and external input and output features.

<table>
<thead>
<tr>
<th>Event</th>
<th>Time (ms)</th>
</tr>
</thead>
</table>
| Chuck 1 | Approx. 80 ms (FAST 60 Hz), approx. 660 ms (MEDIUM 60 Hz), approx. 1.6s (SLOW 60 Hz)  
Approx. 95 ms (FAST 50 Hz), approx. 795 ms (MEDIUM 50 Hz), approx. 1.92s (SLOW 50 Hz)  
Approx. 3 ms  
Approx. 1 ms |
| Chuck 2 |  
Chuck 3 |  
Trigger 1 |  
Trigger 2 |  
Trigger 3 |  
11: Evaluation result | 12: Evaluation result | 13: Evaluation result |
| TRIG |  
EOC |  
HI IN Lo | PASS FAIL |  
NG |  
*11 and 12 differ with the measured object. The figures are reference values in case of pure resistance.  
13: Time from when the measurement value is judged at the point when the trigger is input and until the EOC signal is output. The comparison result is decided on the rising edge of EOC. At this point, the evaluation result is obtained. |

### Nature of external control and outputs (negative logic)

- **Control**
  - CMOS/5 V max.
  - Measurement trigger (TRIG)
  - Comparator output request (MANU)
  - Zero adjustment request (0 ADJ)
  - Print request (PRINT)
  - Comparator table selection (COMP)
  - EXT.DCV (DC5V - 24V)
  - GND

- **Output**
  - Open-collector output/35V - 50mA max.
  - Comparator result signals (Hi, IN, Lo/PASS, FAIL)
  - Measurement termination signal (EOC)
  - Measurement irregularity detection signal (NG)

### RS-232C Interface Specifications

- Transmission method: Start-stop synchronization, full duplex.
- Transmission speed: 9600 bps.
- Data length: 8 bits.
- Parity: None.
- Stop bit: 1 bit.
- Handshake: Hardware.
- Delimiter: CR+LF.

### External Interfaces (Options)

Install the optional 9588 GP-IB interface to gain full remote control of the instrument from a PC. Add the 9589 Printer Interface to enhance the device with printing capabilities via the 9203 Digital Printer or your own Centronics-based printer. Connecting the 9203 provides multi-function printing, such as interval printing, statistical processing of maxima, minima, average, standard deviation, histogram and graph printing.

### 9588 GP-IB Interface Specifications


### 9203 Digital Printer Specifications

- Printer type: Thermal Line Printer
- Statistical processing: Up to 99,999 data points
- Histogram and graphics: Up to 5,000 data points
- Dimensions and mass: Approx. 215 (W)x160 (H)x54 (D) mm, 1.9 kg / [8.5” (W) x 6.3” (H) x 2.1” (D), 35.3 oz.]
- *Note: For further details, please refer to the product catalog for the HIOKI 3550 Battery HiTESTER series, or click onto our website at http://www.hioki.co.jp.

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**Print example**

![Print example](image)
**Specifications**

Measurement method: Resistance AC (1kHz ± 0.2Hz) 4-terminal method
A/D method: Σ-Δ method with sample hold function
Display: Fluorescent character display tube
Auto-ranging: Provided (disabled if comparator is ON)
Input overrange: * OF * display
Measurement irregularity: " ・ ・ ・ " display (NG: External output of measurement irregularity signal)

<table>
<thead>
<tr>
<th>Sampling rate</th>
<th>50 Hz</th>
<th>60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>[FAST]</td>
<td>50 times/s</td>
<td>60 times/s</td>
</tr>
<tr>
<td>[MEDIUM]</td>
<td>6.25 times/s</td>
<td>7.52 times/s</td>
</tr>
<tr>
<td>[SLOW]</td>
<td>1.56 times/s</td>
<td>1.88 times/s</td>
</tr>
</tbody>
</table>

Response time:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Response</th>
<th>[FAST]</th>
<th>[SLOW]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50 Hz</td>
<td>60 Hz</td>
<td></td>
</tr>
<tr>
<td>[FAST]</td>
<td>100 ms</td>
<td>84 ms</td>
<td></td>
</tr>
<tr>
<td>[MEDIUM]</td>
<td>800 ms</td>
<td>667 ms</td>
<td></td>
</tr>
<tr>
<td>[SLOW]</td>
<td>1.92 s</td>
<td>1.60 s</td>
<td></td>
</tr>
</tbody>
</table>

*When non-conductive resistance is measured. The response time differs depending on the measured object.*

**Comparator:**
Comparator output (Resistance/voltage measurement mode)

<table>
<thead>
<tr>
<th>Resistance/Voltage</th>
<th>Normal</th>
<th>HI</th>
<th>Lo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hi fail (red)</td>
<td>FAIL (red)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo fail (red)</td>
<td>FAIL (red)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal (Hi/Lo)</td>
<td>FAIL (red)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Comparator points: Up to 30 comparator condition settings can be memorized.

**Measurement Ranges**

<table>
<thead>
<tr>
<th>Range</th>
<th>30mΩ</th>
<th>300mΩ</th>
<th>3Ω</th>
<th>30Ω</th>
<th>300Ω</th>
<th>3kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>31.000mΩ</td>
<td>310.000mΩ</td>
<td>3.1000Ω</td>
<td>31.000Ω</td>
<td>310.000Ω</td>
<td>3.1000kΩ</td>
</tr>
<tr>
<td>Resolution</td>
<td>1µΩ</td>
<td>10µΩ</td>
<td>100µΩ</td>
<td>1mΩ</td>
<td>10mΩ</td>
<td>100mΩ</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.05%rdg. ±5dgt.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>±0.05%rdg. ±0.6dgt.(°C)</td>
<td>±1.8°F</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* In the case of MEDIUM: Add 3 dgt. to the above dgt. error
* In the case of FAST, the display counter decreases 4 digits in all ranges.

**Voltage measurement**

<table>
<thead>
<tr>
<th>Range</th>
<th>DC 5V</th>
<th>DC 50V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>±5.000V</td>
<td>±5.000V</td>
</tr>
<tr>
<td>Resolution</td>
<td>100µV</td>
<td>1mV</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.05%rdg. ±5dgt.</td>
<td>±0.05%rdg. ±5dgt.</td>
</tr>
<tr>
<td>Temperature</td>
<td>±0.005%rdg. ±0.5dgt.(°C)</td>
<td>±1.8°F</td>
</tr>
</tbody>
</table>

* MEDIUM: Add 3 dgt. to the accuracy dgt. error
* FAST: Add 5 dgt. to the accuracy dgt. error

**Options**

- **9452 CLIP TYPE LEADS**
- **9453 FOUR TERMINAL LEADS**
- **9454 ZERO ADJUSTMENT BOARD**
- **9455 PIN TYPE LEADS**
- **9461 PIN TYPE LEADS**
- **9465 PIN TYPE LEADS**
- **9466 REMOTE CONTROL SWITCH**
- **9467 LARGE CLIP TYPE LEADS**
- **9770 PIN TYPE LEADS**
- **9771 PIN TYPE LEADS**

**3560 AC mΩ HITESTER**

- **9458 GP-IB INTERFACE**

**DISTRIBUTED BY**

Test Equipment Depot - 800.517.8431 - 99 Washington Street Melrose, MA 02176

FAX 781.665.0780 - TestEquipmentDepot.com