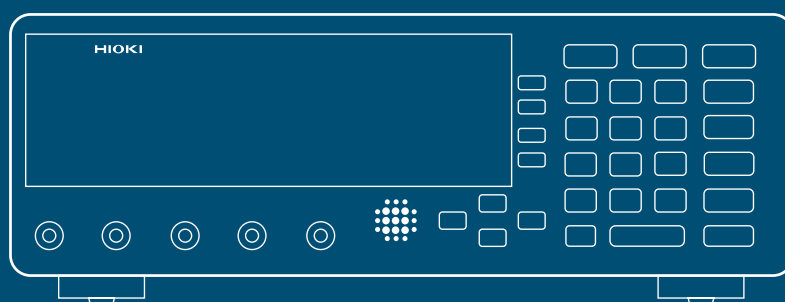


CATALOGO STRUMENTI

Ricerca & Sviluppo

MISURE PRIMARIE

OHMETRI MICROHMETRI MILLIOHMETRI SUPERMEGAOHMETRI



TECNOLOGIA

HIOKI

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TECNOLOGIE DI MISURA



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MISURE PRIMARIE

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STRUMENTI **R&S**

MISURE PRIMARIE ◀

- IMPEDENZIMETRI
- PONTI LCR
- OHMETRI - MICROHMETRI - MILLIOHMETRI - MEGA-OHMETRI - SUPER-MEGA-OHMETRI ◀
- MULTIMETRI
- VOLTMETRI
- WATTMETRI

MONITORAGGIO E CONTROLLO

- DATA LOGGER
- OSCILLOSCOPI REGISTRATORI

PROVE E VERIFICHE

- PROVA BATTERIA
- PROVA RIGIDITA' DIELETTICA ED ISOLAMENTO
- PROVA ISOLAMENTO
- PROVA DI CONTINUITA'
- PROVA CORRENTE DISPERSA

SENSORI e ACCESSORI

HIOKI

RESISTANCE HiTESTER RM3543, RM3543-01

Component measuring instruments



Resistance Meter for Ultra-low and Low Shunt Resistance

Measuring 0.1 mΩ with a High Accuracy of $\pm 0.16\%$
and High Resolution of 0.01 $\mu\Omega^*$

The RM3543 and RM3543-01 Resistance HiTESTERS can measure DC resistance such as a low shunt resistance with high speed and high accuracy using the DC four-terminal method. Shunt resistance of 0.1 mΩ can be measured with an accuracy of $\pm 1\%$. The resistance meters provide advanced contact-check, comparator, and data export functions. In addition, its intuitive user interface and strong noise immunity are suitable for use in automated systems.

* When 10 mΩ range, measurement speed SLOW, and average 16 times are set



ISO 9001
JMI-0216



ISO 14001
JQA-E-90091



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HIOKI company overview, new products, environmental considerations and other information are available on our website.

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Shunt Resistance Meters Capable of Measuring 0.1 mΩ

RESISTANCE HiTESTER RM3543, RM3543-01



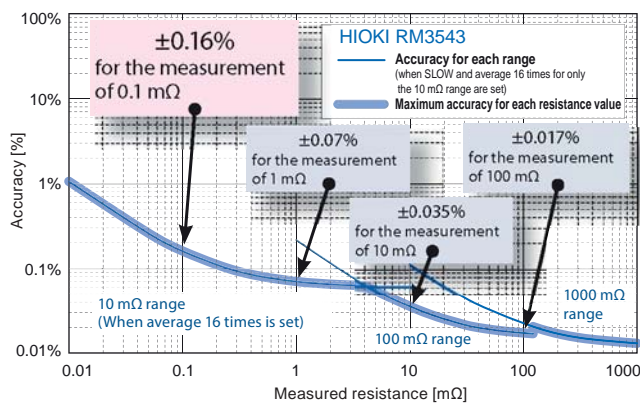
Features

- Measure 0.1 mΩ with a high accuracy of $\pm 0.16\%$
- Superb repeatable measurement accuracy
- User-friendly operability

1. Ultra-accurate and high-resolution resistance meter ideal for incorporation in automated systems.

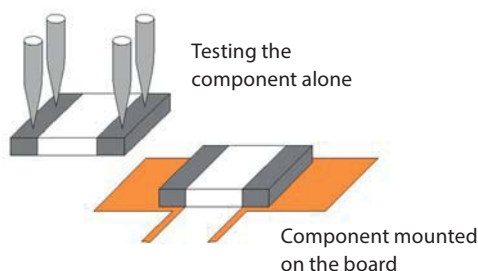
● Advanced Enough to Measure 0.1 mΩ $\pm 1\%$ Shunts with Room to Spare

The shunt resistance meters provide higher efficiency and accuracy. Using the AVERAGE function, 0.1mΩ $\pm 1\%$ shunts can be measured at a high $\pm 0.16\%$ accuracy and high resolution of 0.01 $\mu\Omega$



● Scaling Function Corrects Differences to Simulate Testing Component Mounted on Board

The scaling function can correct the differences in the measurement resistance values between the component alone and the component mounted on the board. The function is useful in testing a current detection resistor for low resistances such as a shunt resistance.



● OVC (Offset Voltage Compensation)

Thermal EMF occurs at the contact point of different metals. This voltage affects measurements, and if large enough, can cause measurement errors. The offset voltage compensation function minimizes the effect of thermal EMF to maintain measurement accuracy. Particularly when measuring shunt resistances and low resistances where the detection voltage is small, OVC is essential to maintain accuracy.

● Maximum Measurement Current of 1 A and Pulse Application Function Reduce Heat Generation of Samples

A pulse application function that applies current only during measurement reduces heat generation that may cause unstable resistance measurement values. In addition, the maximum measurement current of 1 A, a thermal electromotive force cancellation function, and an ultra-low noise measurement circuit minimize the variation in the measurement values.

● Easy Setup Using Numerical Keypad

The user-friendly interface features a high-contrast graphic LCD display, function keys and numerical keypad. Numbers can be input from the numerical keypad easily and speedily to configure the settings for the comparator.

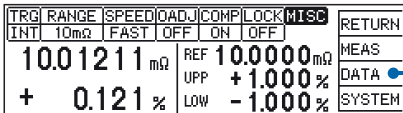


Contact Improver and Check Functions

2. Positive contact assures reliable measurements

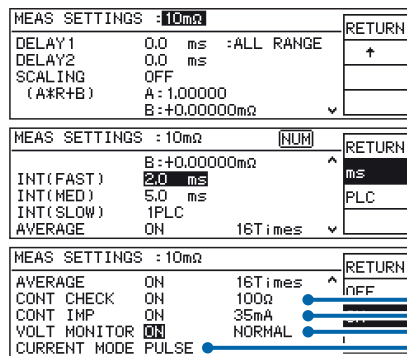
Select contact-check and make other adjustments to ensure accurate measurement and the best performance.

Configuration Screen (MISC)



Measurement Configuration Screen (MEAS)

Configure the settings for various types of contact-check and fine-tune the measurement timing.



● Always-On Contact Checking

High-speed, reliable measurements are achieved by performing contact checks while measuring (instead of before and after, as done until now).

● Contact Improver Function Makes Reliable Contacts Quickly

The “Contact Improver” function improves bad contacts between probes and test samples. Contacts errors are reduced by penetrating oxidation and impurities between probes and samples.

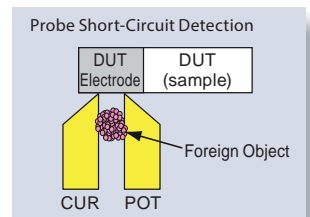
Reducing contact errors can increase productivity and quality. The intensity of the Contact Improver function can be adjusted to suit the probe type.

● Voltage Monitor Function Monitors Contact Condition Changes

The Voltage Monitor function detects large voltage fluctuations due to changes in current terminal contact resistance or noise from mechanical vibrations as contact errors. This increases the reliability of the measured values.

● Probe Short-Circuit Detection Function Ensures Reliable Four-Terminal Measurements

A conductive foreign object between the POT and CUR probe tips inhibits reliable four-terminal measurements. Short-circuited probe anomalies are detected by checking the resistance between these tips when not measuring.



3. Speed and functions required for automated systems have been achieved

● Strong Noise Immunity Meeting the IEC Standard Requirements Ensures Stable Operation in an Industrial Noise Environment

The noise immunity meets the requirements for the IEC61326, 61000-3-2, and 61000-3-3 standards. Even if noise is generated by the on-off operation of a large inductor nearby, the impact on the measurement values is minimized.

● Settings Monitor Function Minimizes Risk of Human Error

When using two instruments, a difference in settings disables TRIG input and causes a warning notification. This function eliminates setting mistakes caused by human error.



● High-speed Data Export and Data Memory Functions

High-speed processing of measured values enables high-speed export to the external interfaces. (RS-232C: 2 ms and GP-IB: 1 ms) Furthermore, the memory function to store 30,000 records enables batch transfer. Statistical calculation and data printing functions useful for production control are also available.

● Measurement Times ^{*1,*2}

Values in parenthesis are for 50 Hz (where timing depends on line frequency), units are in milliseconds

Range	Measurement Speed		
	FAST	MED	SLOW
10mΩ	11	17	40 (47)
100mΩ (1A)	5.0	13	36 (43)
100mΩ (100mA)	3.8	13	36 (43)
1000mΩ	2.0	6.4	35 (41)
10Ω	1.6	6.0	34 (41)
100Ω	1.6	4.0	34 (41)
1000Ω	1.6	4.0	34 (41)

Tolerance: ±10% ±0.2 ms

*1. Under default settings except those specified, without retries.

*2. The measurement time for the average n times is obtained by multiplying the above measurement time by a factor of n.

Example: The measurement time for the 10 mΩ range, SLOW, and the average 16 times is 640 (752) ms.

RM3543 Measurement Accuracy

Conditions of Guaranteed Accuracy

- After 30-minute warm-up time. ● Add $\pm(0.1\%$ measurement accuracy) $^{\circ}\text{C}$ to the accuracy specifications below between 0 and 18°C, and between 28 and 40°C
- Temperature variation after self-calibration must be within $\pm 2^{\circ}\text{C}$.

Resistance Measurement [1-year accuracy (@23 $\pm 5^{\circ}\text{C}$, 80% RH or less)]

Accuracy = $\pm(\%$ rdg. + % f.s.)

(f.s. = calculated 1,000,000 dgt., where 0.001% f.s. = 10 dgt.)

Example. 0.015 + 0.008 0.015% rdg. + 0.008% f.s.

Range	Maximum display value ^{*1}	Resolution	FAST	MEDIUM	SLOW	Measurement current ^{*2}	OVC	Open-Circuit voltage
10m Ω (Average 16 times ^{*3})	12.00000m Ω	10n Ω	0.060+0.005	0.060+0.003	0.060+0.001 ^{*3}	1A	ON	20Vmax ^{*4,*5}
10m Ω					0.060+0.002			
100m Ω (1A)	120.0000m Ω	100n Ω	0.060+0.003	0.060+0.002	0.060+0.001	1A	ON	
100m Ω (100mA)	120.0000m Ω	100n Ω	0.015+0.008	0.015+0.003	0.015+0.002	100mA	ON	
1000m Ω	1200.000m Ω	1 $\mu\Omega$	0.012+0.003	0.012+0.002	0.012+0.001	100mA	ON	
10 Ω	12.00000 Ω	10 $\mu\Omega$	0.010+0.003	0.008+0.002	0.008+0.001	10mA	ON	
100 Ω	120.0000 Ω	100 $\mu\Omega$	0.009+0.003	0.007+0.002	0.007+0.001	10mA	ON	
1000 Ω	1200.000 Ω	1m Ω	0.008+0.003	0.006+0.002	0.006+0.001	1mA	ON	

*1. Negative values can be up to 10% of positive full scale. *2. Measurement current precision is $\pm 5\%$.

*3. When the average ON 16 times or more is set (SLOW is specified only for the 10 m Ω range, other specifications not dependent on AVERAGE setting.)

*4. Voltage when not measuring is 20 mV or less, with current mode set at PULSE and Contact Improver Setting set at OFF/PULSE (measured with a voltmeter having 10 M Ω).

*5. With the sum of resistances of the cables, sample, and contacts less than (open-circuit voltage) / (measurement current).

Example: 1 A measurement current can be used when the sum of resistances of the cables, sample, and contacts is no more than 2 Ω .

RM3543 Specifications

Measurement types	Resistance: 0.00000 m Ω (10 m Ω range) to 1200.000 Ω
Measurement method	Four-terminal, constant-current DC Measurement terminals: 22-mm BNC female jacks
Range switching	Comparator on: Auto-range setting according to comparator reference or upper threshold setting. Comparator off: Manual range setting
Zero-Adjustment	Range: -1 to 10 Ω (wiring resistance compensation for two-terminal measurements)
Trigger	Internal or External
Sampling	Fast, Medium, and Slow
Integration time setting function ^{*1}	0.1 to 100.0 ms, PLC ^{*2} setting available 1 to 5 PLC @ 50 Hz, 1 to 6 PLC @ 60 Hz *2. One PLC = one power line cycle (mains waveform period)
Delay	DELAY1 = Set to allow for mechanical delay of trigger input and probing (affects all ranges), from 0.0 to 100.0 ms DELAY2 ^{*1} = Set to allow for measurement object response (each range independently), from 0.0 to 100.0 ms
Functions	Self-calibration, probe short-circuit detection, Contact Improver, current mode setting, OVC (offset voltage compensation), settings monitor, retry, average (OFF, 2 to 32 times), scaling, statistical calculations, key-lock, comparator (relative tolerance or absolute range modes), EOM pulse width setting, data export, binary data output, auto-memory

*1. Settable for each range independently

Measurement fault detection functions	Out-of-range detection, contact check, current monitor, voltage monitor
Memory storage	30,000 values (volatile memory, no backup)
Interfaces	EXT I/O, RS-232C, Printer, Settings Monitor Functional terminals (SET MONITOR) GP-IB (Model RM3543-01)
RS-232C bit rates	9,600, 19,200, or 38,400 bps

RM3543 General Specifications

Operating temperature and humidity	0°C (32°F) to 40°C (104°F), 80% RH or less (non-condensating)
Storage temperature and humidity	10°C (50°F) to 50°C (122°F), 80% RH or less (non-condensating)
Operating environment	Indoors, Pollution Degree 2, up to 2,000 m (6,562 ft) ASL
Rated mains supply voltage	100 to 240 V AC $\pm 10\%$
Rated mains supply frequency	50 / 60 Hz
Power consumption	40 VA
Insulation withstand potential	1.62 kV AC for 15s, with 10 mA cutoff current Between all mains supply terminals and protective ground, interfaces, and measurement jacks
Dimensions	Approx. 260 mm (10.24 in) W \times 88 mm (3.46 in) H \times 300 mm (11.81 in) D (without projections)
Mass	Approx. 3.0 kg (105.8 oz)
Accessories	Power cord $\times 1$, EXT I/O male connector $\times 1$, Operation manual $\times 1$, Operation guide $\times 1$
Applicable Standards	Safety: EN61010 EMC: EN61326, EN61000-3-2, EN61000-3-3

Ordering information

RESISTANCE HiTESTER RM3543

RESISTANCE HiTESTER RM3543-01
(with GP-IB interface)

**Test fixtures are not supplied with the unit.
Select an optional test fixture when ordering.**

Optional accessories

- 4-TERMINAL PROBE 9140 (1 m (3.28 ft))
- TEST FIXTURE 9262 (direct connection type)
- SMD TEST FIXTURE 9263 (direct connection type)
- 4-TERMINAL PROBE 9500 (1 m (3.28 ft))
- GP-IB CONNECTION CABLE 9151-02 (2 m (6.56 ft))
- RS-232C CABLE 9637 (9-pin to 9-pin crossed cable / 1.8 m (5.91 ft))
- RS-232C CABLE 9638 (9-pin to 25-pin crossed cable / 1.8 m (5.91 ft))

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

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RESISTANCE METER RM3542A, RM3542

NEW

An Evolution in Stable Measurements

Perfect for Taping Machines and Sorting Machines

NEW RM3542A

Supports Resistance Measurements for
Miniature 008004-size Electronic Parts (0.25 mm × 0.125 mm)


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New
concept

RM3542A The Evolution is Here

Improved Productivity and Low-impact Measuring



Minimized Variations and Enhanced Measurement Range

RM3542A

An fuller lineup of measurement ranges means that more appropriate ranges and higher resolution testing are now available for your application. The new measurement currents that complement the added ranges ensure detection voltage, improve the S/N ratio and suppress variation.

Achieve Stable Measurements in a Wide Measurement Range
Range added with RM3542A

150 Ω
Measurement
Comparison

Example of Reduced Variation with the New Range

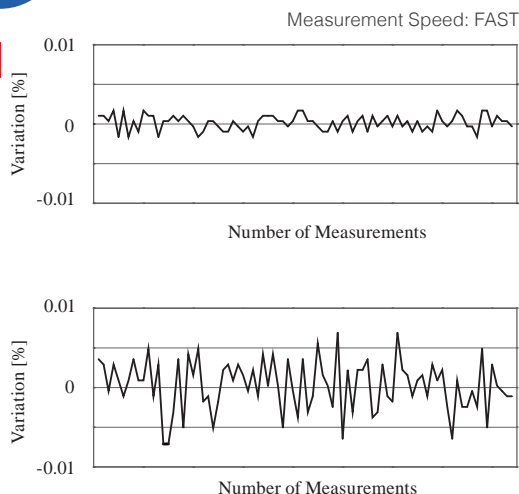
Comparison data with the same sample

Range	Measurement Current
100 mΩ	100 mA
1000 mΩ	100 mA
3 Ω	33.3 mA
10 Ω	10 mA
100 Ω	10 mA
300 Ω	3.33 mA
1000 Ω	1 mA
10 kΩ	1 mA
30 kΩ	333 μA
100 kΩ	100 μA
300 kΩ	33.3 μA
1000 kΩ	10 μA
3 MΩ	3.33 μA
10 MΩ	1 μA
30 MΩ	333 nA
100 MΩ	100 nA

New concept

300 Ω Range

1000 Ω Range

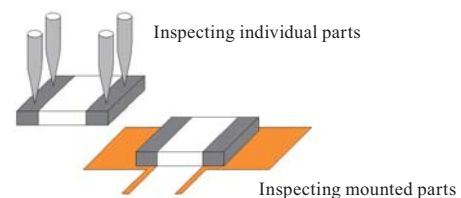


Scaling Function Used to Compensate for Mounted State

New concept

RM3542A

Use the Scaling Function to compensate for the differences in resistance when inspecting individual parts and parts mounted on a board. This function is very useful for inspecting the current detection resistance of low resistors, such as shunts.



Reduce Contact Error Rate and Increase Production Volume

RM3542A

The RM3542A represents an evolution in the Contact Improver Function*1 for low-power measurements. Contact errors are reduced by improved contact between probes and samples.

*1 The Contact Improver Function is described on Page 4.

New concept Low-impact Contact Improvement by Suppressing Rush Current

By suppressing the surge of rush current into samples, there is now a broader range of scenarios in which contact improvement can be used, such as the inspection of small ferrite beads and small 008004-sized (0.25 mm x 0.125 mm) resistors.

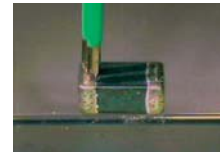
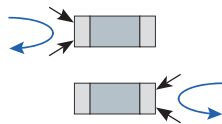


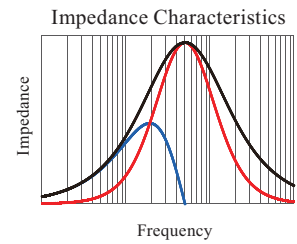
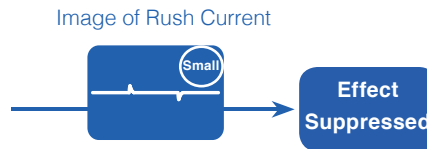
Image of Contact

Contact Improvement by Suppressing Characteristic Changes in Ferrite Beads

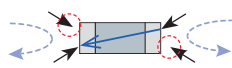
RM3542A : Alternating Contact Improvement on the H Side and L Side



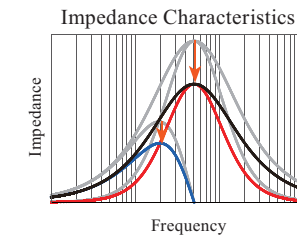
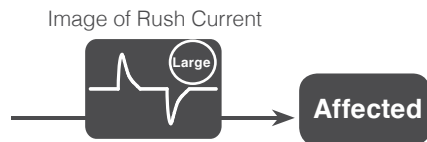
Rush current into samples is reduced.



RM3542 : Simultaneous Contact Improvement on the H Side and L Side



If the probe has poor contact, rush current flows into the sample.



[Low-impact Contact Improvement Conditions] LOW POWER: ON or Applied Voltage Limit Function: ON, and Contact Improver Function set to Pulse.

Low-impact Measurement of Miniature 008004-sized Parts (0.25 mm x 0.125 mm)

RM3542A

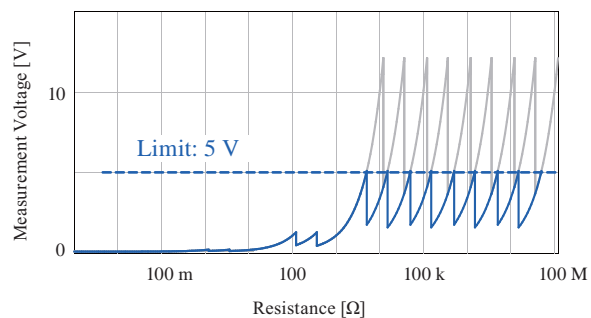
By limiting applied voltage to 5 V or less when measuring, it is possible to measure 008004 size (0.25 mm x 0.125 mm) parts that have a low rated voltage without applying stress.

Applied Voltage Limit Function: OFF

Object under test	Measurement Current	Applied Voltage
:	:	:
1 kΩ	1 mA	1 V
2 kΩ		2 V
3 kΩ		3 V
4 kΩ		4 V
5 kΩ		5 V
6 kΩ		6 V
7 kΩ		7 V
8 kΩ		8 V
9 kΩ		9 V
10 kΩ		10 V
:	:	:

No Limit

Applied Voltage Limit Function ON Applied Voltage Limit Function OFF



Applied Voltage Limit Function: ON

Object under test	Measurement Current	Applied Voltage
:	:	:
1 kΩ	1 mA	1 V
2 kΩ		2 V
3 kΩ		3 V
4 kΩ		4 V
5 kΩ		5 V
6 kΩ	333 μA	2 V
7 kΩ		2.3 V
8 kΩ		2.6 V
9 kΩ		3 V
10 kΩ		3.3 V
:		:

New concept

Voltage Limit

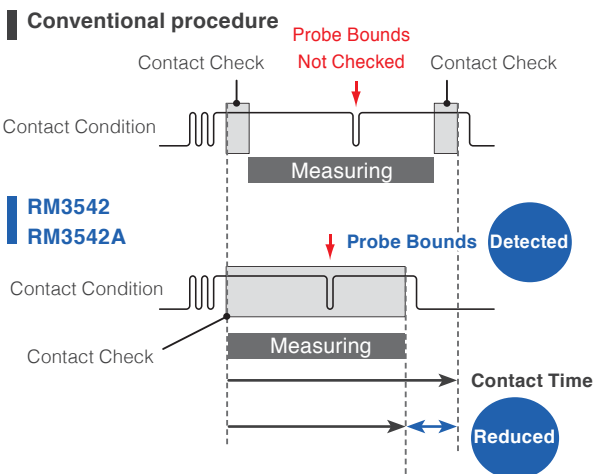
Measurement Current	Range of Application	
	Applied Voltage Limit OFF	Applied Voltage Limit ON
1 mA	10 kΩ	5 kΩ
333 μA	30 kΩ	15 kΩ
100 μA	100 kΩ	50 kΩ
33.3 μA	300 kΩ	150 kΩ
10 μA	1000 kΩ	500 kΩ
3.33 μA	3 MΩ	1500 kΩ
1 μA	10 MΩ	5 MΩ
333 nA	30 MΩ	15 MΩ
100 nA	100 MΩ	50 MΩ

Consistent Reliability

Perfect for Automation

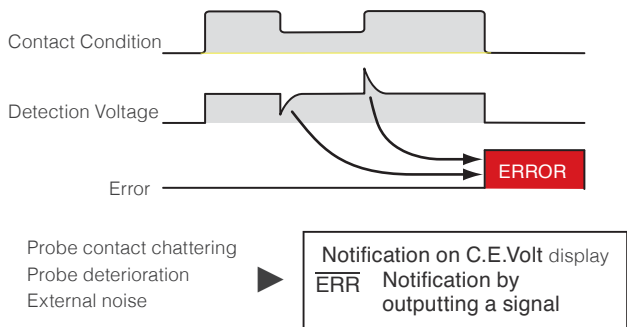
Reliability Improved with Positive Contact Contact Checking while Measuring

Reliable checking and reduced contact time are achieved by performing contact checks while measuring, instead of before and after, as is traditionally done.



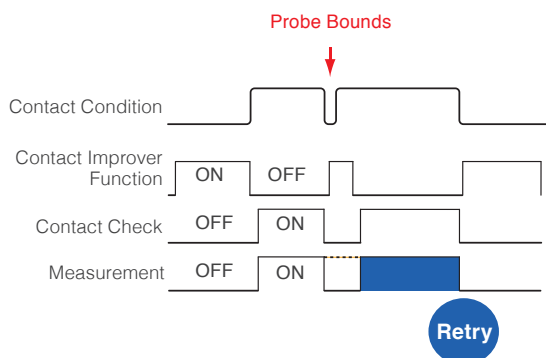
Monitor Contact Condition Detect Contact Errors (Voltage Monitor Function)

Large voltage fluctuations due to changes in current terminal contact resistance or noise from mechanical vibrations are detected as errors.



Reduce Contact Error Rate Repeat Measurement when an Error Occurs (Retry Function)

The Retry Function automatically repeats the measurement when a fault occurs due to probe chatter.



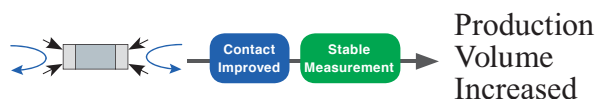
RM3542A RM3542

Shared Features

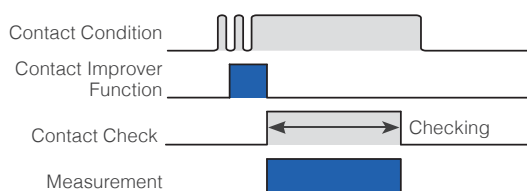
Productivity Improved

Reduce Contact Error Rate Contact Improver Function Ensures Quick and Reliable Contact

Contact is improved by penetrating oxidation and impurities between probes and samples. Measurements stabilized by improving poor contact, and a reduction in the contact error rate, lead to improvements in productivity.



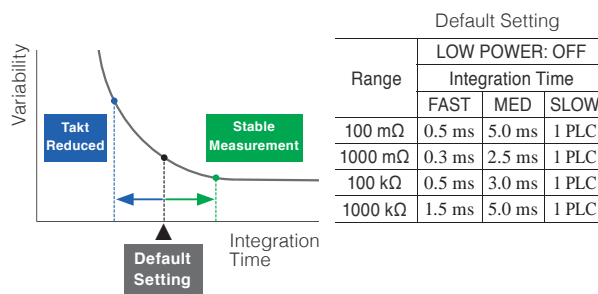
Choices for contact improvement current: 17 mA, 25 mA, 35 mA (default value), 50 mA



Noise Resistant

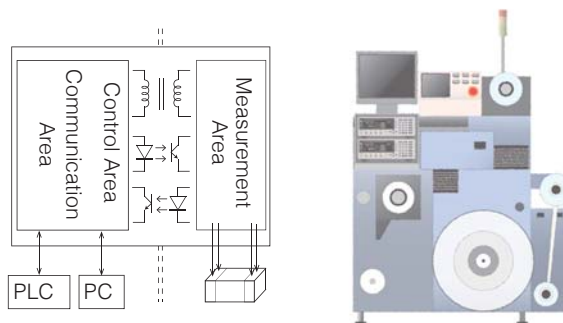
Reduce Measurement Time for More Stable Measurements Integration Time Setting Function

You can set the integration time as desired for each range. Set a short integration time to reduce the takt time, or a long integration time for more stable inspection.



Noise-Resistant Floating Structure

The floating structure of the measurement area minimizes any effects from nearby noise on the measurement values.



Recording, Statistics, Output



RM3542A (w/ GP-IB)

Data Storage Function

Saving to Internal Memory via Trigger Signal or Key Operation

All trigger measurement values during external trigger measurement, or trigger input for measurements during internal trigger settings, are saved to internal memory (30000 Max.).

Auto-Memory Function

Auto [Saving] and [Printing] when Measurement Values are Stable

During internal trigger settings, measurement values can be automatically saved to memory when a probe contacts resistance. When the set number (max. 99) is saved to memory the function stops, statistical calculations are performed, and the data is output to the screen or a printer (RS-232C).

Printing Example (NORMAL)

```

7 219.701 Ohm IN
8 220.031 Ohm IN
9 220.687 Ohm IN
10 150.119 Ohm Lo
11 330.065 Ohm Hi
12 OvrRng Hi
13 C.E.Lo --
14 C.E.Hi --
    
```

Printing Example (SAMPLE)

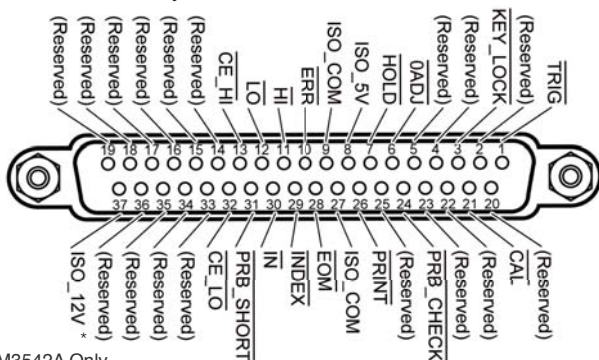
```

-0.136%/IN +0.014%/IN +0.312%/IN
-31.764%/Lo +50.030%/Hi+999.999%/Hi
MEAS.ERR/-- MEAS.ERR/--
    
```

3 sets of data are printed on 1 line to save paper.

External Output

RM3542A Pin Layout



*RM3542A Only

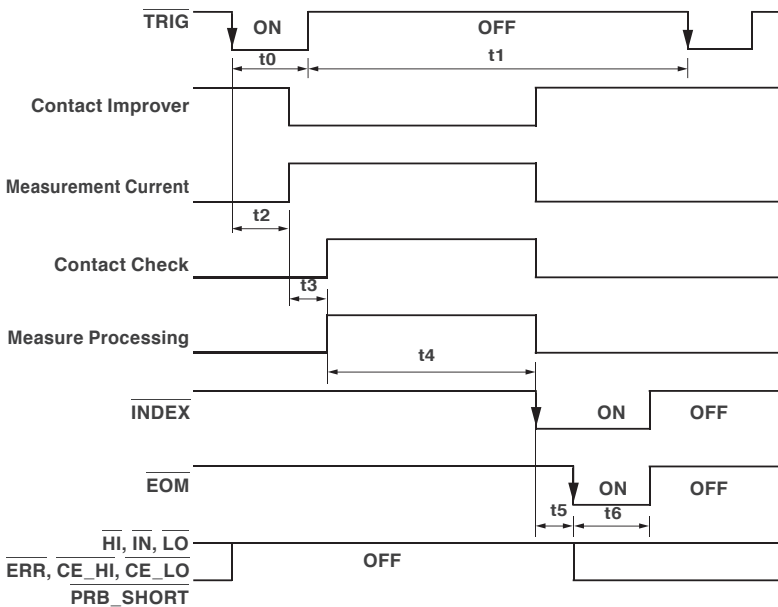
Connector

Connector used : 37-pin D-sub female connector with #4-40 inch screws (on the main unit)
 : DC-37P-ULR (solder type), DCSP-JB37PR (crimped type)
 Compatible connectors Japan Aviation Electronics Industry, Ltd.

Electrical Specifications

Input Signals	Input type	Photocoupler isolation: Non-voltage contact inputs (Current sync output supported) (negative logic)
	Input ON voltage	1 V or less
	Input OFF voltage	OPEN or 5 V to 30 V
	Input ON current	3 mA/ch
	Max. applied voltage	30 V
Output Signals	Output type	Optocoupler-isolated Nch open-drain outputs (Current sync) (negative logic)
	Max. load voltage	30 V
	Max. output current	50 mA/ch
	Residual voltage	1 V (10 mA), 1.5 V (50 mA)
Built-in Insulation Power	+5 V power output	
	Output voltage	4.5 V to 5.0 V
	Max. output current	100 mA
	+12 V power output	
	Output voltage	11.0 V to 13.0 V
	Max. output current	20 mA
	External power input	None

Example of Typical EXT. I/O Timing



t0	Trigger Pulse ON	0.1 ms or greater	Rising/Falling edge selection possible
t1	Trigger Pulse OFF	0.1 ms or greater	
t2	Delay 1	0 to 100 ms	According to settings
t3	Delay 2	0 to 100 ms	According to settings (0.1 ms or 0.3 ms added when the Contact Improver Function is set to Pulse)
t4	Measurement Time	0.1 ms to 100 ms	According to sampling speed, OVC settings, measurement range and power supply frequency
t5	Calculation Time	0.1 ms	Delayed when statistical calculation and the memory function are ON.
t6	EOM Pulse Width	1 to 100 ms	According to settings

EXT.I/O Signal List

Input Signals

TRIG	External Trigger
OADJ	Zero-Adjust
PRINT	Printing
CAL	Self-Calibration
HOLD	Hold
PRB_CHECK	Probe Short-Circuit Detection
KEY_LOCK	Key Lock

Output Signals

ERR	Measurement Fault Output
CE_HI	Contact error (H _{CUR} , H _{POT} side)
CE_LO	Contact error (L _{CUR} , L _{POT} side)
PRB_SHORT	Probe short-circuit error
INDEX	End of Import
EOM	End of Measurement
HI, IN, LO	Comparator judgment
ISO_5V	Isolated power +5 V output
ISO_12V	Isolated power +12 V output
ISO_COM	Isolated power common

Requirement Specification (Printer)

Interface	RS-232C	RM3542 Main unit connector	1 2 3 4 5		
Characters per line	At least 45		6 7 8 9		
Communication speed	9600 bps	Function	Signal Name	Pin	
Data bits	8 bit	Receive Data	R x D	2	
Parity	None	Transmit Data	T x D	3	
Stop bits	1 bit	Signal Ground	GND	5	
Flow control	None				

General Specifications

Operating environment	Indoors, pollution degree 2, altitude up to 2000 m (6562 ft)
Operating temperature and humidity	0°C to 40°C (32°F to 104°F), 80% RH or less(no condensation)
Storage temperature and humidity	-10°C to 50°C (14°F to 122°F), 80% RH or less(no condensation)
Power supply/Maximum rated power consumption	100 V to 240 V AC (50 Hz/60 Hz)/30 VA
Dielectric strength	1.62 kV AC, 1 minute Between all mains supply terminals and protective ground, interfaces, and measurement jacks
Compliance standard	EMC: EN61326, EN61000 Safety: EN61010
Dimensions/mass	Approx. 260 mm (10.24 in) W × 88 mm (3.46 in) H × 300 mm (11.81 in) D, Approx. 2.9 kg (102.3 oz)
Accessories	Power cord × 1, Instruction manual × 1, Operation guide × 1 EXT.I/O male connector × 1

Measurement Method

Measurement types	DC resistance
Measurement signal	Constant current
Measurement method	Four-terminal DC
Measurement terminals	22 mm pitch BNC female terminal
Measurement speed	FAST/MED/SLOW

Comparator Function

(Determination method: REF% Mode/ABS Mode)

Measurement range	REF% (Relative Value Determination) Mode <ul style="list-style-type: none"> Reference value: Setting range 0.00 mΩ to 120.00 MΩ (LOW POWER: OFF) 0.0 mΩ to 1200.0 Ω (LOW POWER: ON) <ul style="list-style-type: none"> Upper/Lower limit value: Setting range -9.999% to 9.999% (when less than 10%) -99.99% to 99.99% (when 10% or greater)
	ABS (Absolute Value Determination) Mode <ul style="list-style-type: none"> Upper/Lower limit value: Setting range 0.00 mΩ to 120.00 MΩ (LOW POWER: OFF) 0.0 mΩ to 1200.0 Ω (LOW POWER: ON)
Judgment	COMP lamp (Hi/IN/Lo), external output, beeping sound: IN, HI/LO, LOW, HIGH (default setting OFF)

Contact Check Function

Operation details	Checks the connections between the H _{POT} -H _{CUR} terminals and between the L _{POT} -L _{CUR} terminals (for each range)
Threshold value	50 Ω/ 100 Ω/ 150 Ω/ 200 Ω (default value)/ 300 Ω/ 400 Ω/ 500 Ω
Judgment	Error display (CE_HI/CE_LO), external output
Implementation timing	Before integration time (response time) until measuring is in progress

Trigger/Delay Function

Trigger (Select)	Internal trigger (automatic continuous measurement) External trigger (measurements are triggered by an external signal)
Delay	DELAY 1: Common to all ranges Mechanical adjustment of stable time during probe contact Measurement range: 0.0 ms to 100.0 ms
	DELAY 2: Each range Adjustment of time from the application of a measurement current (such as an inductor) until the value is stable Measurement range: 0.0 ms to 100.0 ms

Measurement Time: Power supply frequency 50 Hz (60 Hz), default settings

Color: RM3542A only

Tolerance: ±10% ±0.2 ms

Range	LOW POWER: OFF		
	FAST	MED	SLOW
100 mΩ	3.8 ms	13 ms	43 ms (36 ms)
1000 mΩ	2.0 ms	6.4 ms	41 ms (35 ms)
3 Ω	1.6 ms	6.0 ms	41 ms (34 ms)
10 Ω	1.6 ms	6.0 ms	41 ms (34 ms)
100 Ω	0.9 ms	3.6 ms	21 ms (17 ms)
300 Ω	0.9 ms	3.6 ms	21 ms (17 ms)
1000 Ω	0.9 ms	3.6 ms	21 ms (17 ms)
10 kΩ	1.0 ms	3.6 ms	21 ms (17 ms)
30 kΩ	0.9 ms	3.6 ms	21 ms (17 ms)
100 kΩ	1.3 ms	3.8 ms	21 ms (18 ms)
300 kΩ	1.3 ms	3.8 ms	21 ms (18 ms)
1000 kΩ	2.5 ms	6.0 ms	21 ms (18 ms)
3 MΩ	2.5 ms	6.0 ms	21 ms (18 ms)
10 MΩ	5.3 ms	23 ms (20 ms)	23 ms (20 ms)
30 MΩ	5.8 ms	23 ms (20 ms)	23 ms (20 ms)
100 MΩ	26 ms (22 ms)	46 ms (39 ms)	86 ms (72 ms)

Range	LOW POWER: ON		
	FAST	MED	SLOW
1000 mΩ	2.3 ms*	12 ms	42 ms (35 ms)
3 Ω	2.3 ms	12 ms	42 ms (35 ms)
10 Ω	2.3 ms*	12 ms	42 ms (35 ms)
100 Ω	1.7 ms	6.1 ms	41 ms (34 ms)
300 Ω	3.2 ms	7.6 ms	36 ms (43 ms)
1000 Ω	7.2 ms	12 ms	47 ms (40 ms)

* Add 0.2ms when using the RM3542

OVC Function (Offset Voltage Compensation)

Operation details	Inverts current polarity to remove offset caused by thermal EMF
Effective range	LOW POWER OFF: 100 mΩ range to 10 Ω range LOW POWER ON: All ranges

Recording/Interface

Memory storage	Measurement values are recorded by the EXT.I/O TRIG signal and F4 [MANU] button.
	Number of memory slots: 30000 (volatile memory, no backup)
Auto-Memory Function	Statistical Calculation Functions: Statistical calculations are performed for measurement values saved to memory. (Calculation contents: Total data count, average value, minimum value, maximum value, sample standard deviation, population standard deviation, process capability index) Calculation results: Displayed on screen/printed
	Loading when measured value is stable, with manual measurement by internal continuous trigger (A beeping sound is heard if the specified value is reached.) Memory slots: 1 to 99
Interface	EXT.I/O, RS-232C, Printer, Settings Monitor Function terminals (SET MONITOR terminals), GP-IB (RM3542-51, RM3542-01 only)

RS-232C

Connector	D-sub 9-pin connector
Flow control	None
Transmission rate	9600 bps, 19200 bps, 38400 bps

GP-IB (RM3542-01 and RM3542-51 only)

Connector	24-pin Centronics type connector
Compliance standard	IEEE-488.1 1987
Reference standard	IEEE-488.2 1987
Terminator	LF, CR+LF

Measurement Specifications Color: RM3542A only

Resistance measurement accuracy Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 1 year

Conditions of guaranteed accuracy

- Warm-up time 30 minutes or more
- Integration time Longer than the default value for the Integration Time Setting Function
(No regulation for settings in ms if the default value is set to PLC)

Temperature and humidity range for guaranteed accuracy 23°C ±5°C (73°F ±9°F), 80% RH or less

Temperature fluctuation after self-calibration must be within ±2°C (±3.6°F). Add Temperature Coefficient ±(1/10 of measurement accuracy)/°C for the following ranges: 0°C to 18°C (32°F to 64°F) and 28°C to 40°C (82°F to 104°F).

LOW POWER: OFF

Range	Maximum Display Value ¹	Resolution	Measurement Accuracy: ± (%rdg. + % f.s.)			Measurement Current ²	Open-Circuit Voltage
			FAST	MED	SLOW		
100 mΩ	120.0000 mΩ	100 nΩ	0.015 + 0.008	0.015 + 0.003	0.015 + 0.002	100 mA	20 V max *3, *4, *5
1000 mΩ	1200.000 mΩ	1 μΩ	0.012 + 0.003	0.012 + 0.002	0.012 + 0.001	100 mA	
3 Ω	3.60000 Ω	10 μΩ	0.012 + 0.003	0.012 + 0.002	0.012 + 0.001	33.3 mA	
10 Ω	12.00000 Ω	10 μΩ	0.010 + 0.003	0.008 + 0.002	0.008 + 0.001	10 mA	
100 Ω	120.0000 Ω	100 μΩ	0.009 + 0.003	0.007 + 0.002	0.007 + 0.001	10 mA	
300 Ω	360.000 Ω	1 mΩ	0.009 + 0.003	0.007 + 0.002	0.007 + 0.001	3.33 mA	
1000 Ω	1200.000 Ω	1 mΩ	0.008 + 0.003	0.006 + 0.002	0.006 + 0.001	1 mA	
10 kΩ	12.00000 kΩ	10 mΩ	0.009 + 0.003	0.007 + 0.002	0.007 + 0.001	1 mA	
30 kΩ	36.0000 kΩ	100 mΩ	0.009 + 0.003	0.007 + 0.002	0.007 + 0.001	333 μA	
100 kΩ	120.0000 kΩ	100 mΩ	0.010 + 0.003	0.007 + 0.002	0.007 + 0.001	100 μA	
300 kΩ	360.000 kΩ	1 Ω	0.010 + 0.003	0.007 + 0.002	0.007 + 0.001	33.3 μA	
1000 kΩ	1200.000 kΩ	1 Ω	0.010 + 0.003	0.008 + 0.002	0.008 + 0.001	10 μA	
3 MΩ	3.60000 MΩ	10 Ω	0.010 + 0.003	0.008 + 0.002	0.008 + 0.001	3.33 μA	
10 MΩ	12.00000 MΩ	10 Ω	0.030 + 0.004			1 μA	
30 MΩ	36.0000 MΩ	100 Ω	0.030 + 0.010			333 nA	
100 MΩ	120.0000 MΩ	100 Ω	0.100 + 0.020			100 nA	

LOW POWER: ON

Range	Maximum Display Value ¹	Resolution	Measurement Accuracy: ± (%rdg. + % f.s.)			Measurement Current ²	Open-Circuit Voltage
			FAST	MED	SLOW		
1000 mΩ	1200.000 mΩ	1 μΩ	0.010 + 0.008	0.008 + 0.003	0.008 + 0.002	10 mA	10 V max (RM3542A) *3, *5
3 Ω	3.60000 Ω	10 μΩ	0.010 + 0.008	0.008 + 0.003	0.008 + 0.002	3.33 mA	
10 Ω	12.00000 Ω	10 μΩ	0.010 + 0.008	0.008 + 0.003	0.008 + 0.002	1 mA	20 V max (RM3542) *3, *5
100 Ω	120.0000 Ω	100 μΩ	0.010 + 0.003	0.008 + 0.002	0.008 + 0.001	1 mA	
300 Ω	360.000 Ω	1 mΩ	0.010 + 0.003	0.008 + 0.002	0.008 + 0.001	333 μA	
1000 Ω	1200.000 Ω	1 mΩ	0.020 + 0.003	0.008 + 0.002	0.008 + 0.001	100 μA	

¹Negative values can be up to 10% of positive full scale.

²Measurement current accuracy is ±5%.

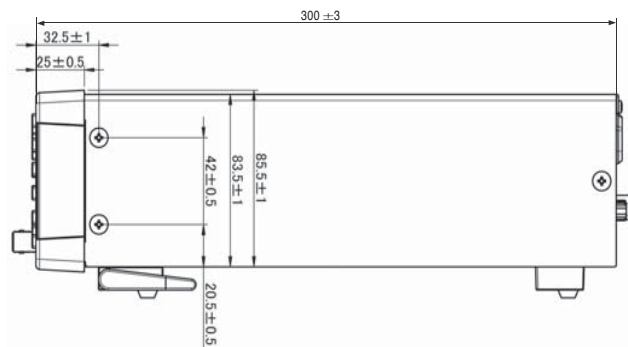
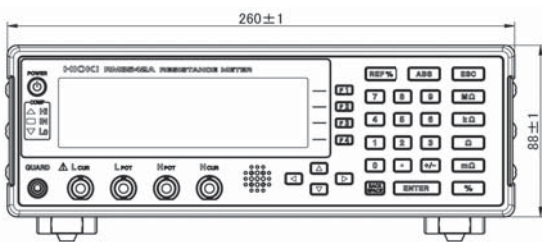
³Voltage when not measuring is 20 mV or less, with current mode set at PULSE and Contact Improver Setting set at OFF/PULSE (with a voltmeter having 10 MΩ).

⁴VOLTAGE LIMIT ON: 10 V max

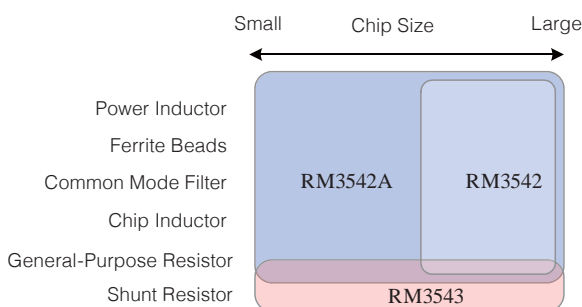
⁵With the sum of resistances of the probes, sample, and contacts less than (open-circuit voltage) / (measurement current).

Example. 100 mA measurement current can be used when the sum of resistances of the probes, sample, and contacts is no more than 20 Ω.

Dimensions (Units: mm)



Recommended Model for Each Type of Measurement



Related Products

Resistance Meter for the Ultra-Low Shunt Era RM3543



- Inspection of 0.1 mΩ at a high accuracy of 0.16%, and a high resolution of 0.01 μΩ. Shunt resistor load inspection with superior accuracy and resolution.
 - Excellent repetitive measurement accuracy
 - Intuitive user interface and superb noise immunity ideal for use with automated equipment
- RM3543
RM3543-01 (With GP-IB)

Product Name: RESISTANCE METER RM3542A

Model No. (Order Code)	GP-IB
RM3542-50	—
RM3542-51	Included

Product Name: RESISTANCE METER RM3542

Model Name (Order code)	GP-IB
RM3542	—
RM3542-01	Included

Options

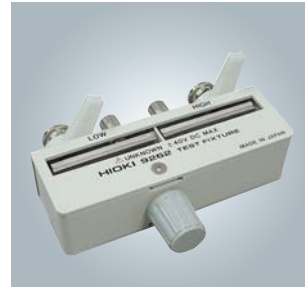
Probes and Fixtures (for connection to measurement terminals)



FOUR-TERMINAL PROBE 9140-10
(for RM3542A)

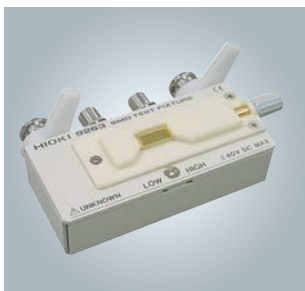
FOUR-TERMINAL PROBE 9140
(for RM3542)

For test lead parts
Diameter of supported measurement
terminals: 0.3 to 5 mm (0.01 to 0.20 in)
Cable length: 1 m (3.28 ft)



TEST FIXTURE 9262

For test lead parts
Diameter of supported measurement
terminals: 0.3 to 2 mm (0.01 to 0.08 in)
Pitch of test lead: 5 mm (0.20 in) or
greater
Connects directly to main unit



SMD TEST FIXTURE 9263

For SMD with electrodes on the sides
Supported sample sizes:
2012 to 5750 (JIS)
0805 to 2220 (EIA)
Sample width: 1 to 10 mm (0.04 to 0.39 in)
Connects directly to main unit

World's First Highly Accurate
4-Terminal Measurement



SMD TEST FIXTURE IM9100

For SMD with electrodes
on the bottom
Supported sample sizes:
0402 to 1005 (JIS)
01005 to 0402 (EIA)
Connects directly to main unit

See the product catalogs for details.

■ Recommended Measurement Cable Specifications

Conductor resistance	500 mΩ/m or less
Capacitance	150 pF/m or less
Cable dielectric material	Polyethylene (PE), Teflon* (TFE), Polyethylene Foam (PEF) Insulation resistance: 10 GΩ or greater
Connector insulator material	Teflon* (TFE), Polybutylene Terephthalate (PBT) Insulation resistance: 10 GΩ or greater
Length	2 m (6.56 ft) or less
Recommended cables (examples)	JIS Standard 3C-2V, 1.5D-2V, MIL Standard RG-58A/U

*Teflon is a registered trademark of DUPONT, Inc.

Communication Interfaces

RS-232C CABLE 9637



9pin-9pin, cross
Cord length: 1.8 m (5.91 ft)

RS-232C CABLE 9638



9pin-25pin, cross
Cord length: 1.8 m (5.91 ft)

GP-IB CONNECTION CABLE 9151-02



Cord length: 2 m (6.56 ft)

HIOKI
HIOKI E. E. CORPORATION

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

HIOKI

RESISTANCE METER RM3545, RM3544



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

CE

asita
TECNOLOGIE DI MISURA

Choose from two models based on your application



RM3545

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

● Resistance measurement

Basic accuracy : **0.006%** Max. resolution : **0.01 $\mu\Omega$**
Max. measurable current : **1A**

● Low power resistance measurement

Basic accuracy : **0.2%** Max. resolution : **0.01m Ω**
Max. measurable current : **1mA** Max. Open-circuit voltage : **20mV**



RM3544

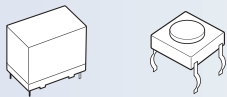
High-accuracy bench-top meter
for both manual operation
and integration with automatic lines

Basic accuracy : **0.02%** Max. resolution : **1 $\mu\Omega$**
Max. measurable current : **300mA**

Applications

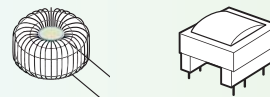
■ Small-signal contacts

RM3545



■ Motors, solenoids, choke coils, transformers, wire harnesses

RM3545 RM3544



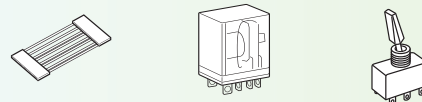
■ Compact fuses, airbag inflator, compact magnetic components (EMC filters, ferrite beads)

RM3545



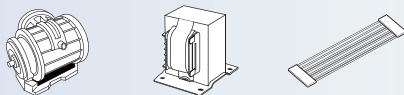
■ Contacts, wire harnesses, relay contacts, switches

RM3545 RM3544



■ Multi-contact resistance measurement (motor and transformer windings)

RM3545-02



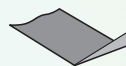
■ Fuses, resistors, heaters, wires, welds

RM3545 RM3544



■ Conductive rubber, paint

RM3545 RM3544



General specifications

RESISTANCE METER RM3545		RESISTANCE METER RM3544
0.00 $\mu\Omega$ to 1200M Ω	Measurement types (4-terminal direct current)	0.000 m Ω to 3.5 M Ω
✓	Temperature measurement, Temperature correction (TC), comparator, judgment sound setting, auto hold	✓
✓	Low power resistance measurement (LP)	N/A
✓	Temperature rise (Temperature conversion (ΔT))	N/A
✓	Offset voltage compensation (OVC)	N/A
✓	D/A output	N/A
✓ RM3545-02 : Max. 20ch	Multiplexer	N/A

Multi-point measurement with the Multiplexer Unit Z3003 (20 locations with 4-terminal measurement)

RM3545-02

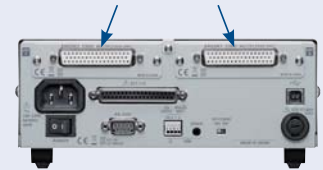
Scanning measurement using the Multiplexer Unit Z3003 is convenient in applications that require multi-contact measurement, for example when testing network resistors, steering switches, or 3-phase motor windings. Simply insert a Z3003 unit into one of the slots on the back of the RM3545-02 to enable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

Insert up to two Z3003 units into the slots on the back of the instrument.



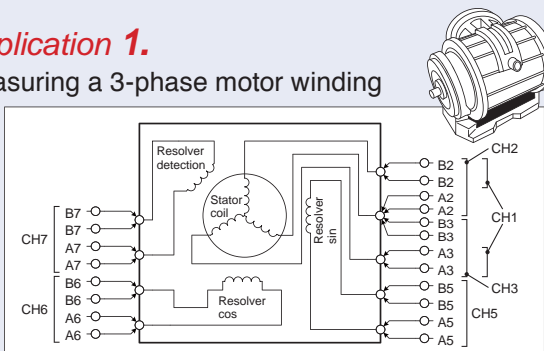
Multiplexer unit Z3003 (Option)



Pictured: Back of the RM3545-02 with two Z3003 units (optional feature) installed

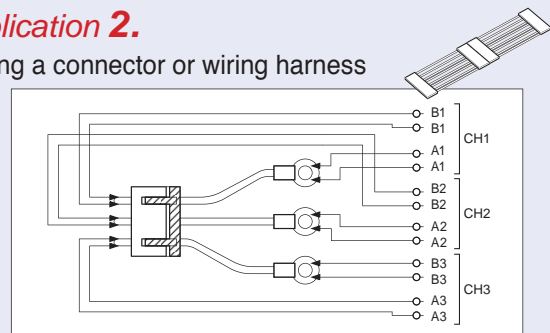
Application 1.

Measuring a 3-phase motor winding



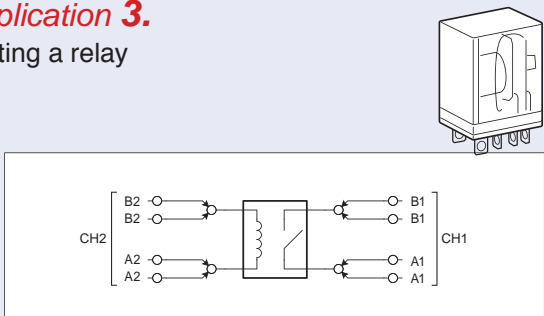
Application 2.

Testing a connector or wiring harness



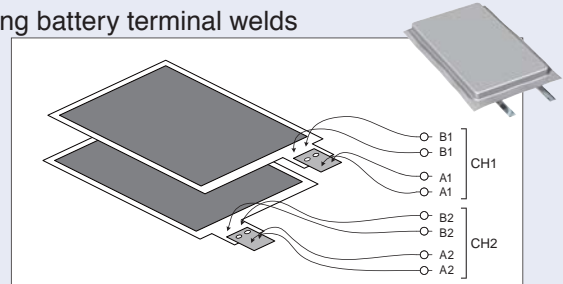
Application 3.

Testing a relay



Application 4.

Testing battery terminal welds



Probes suited to manual measurement on production lines

RM3545

RM3544



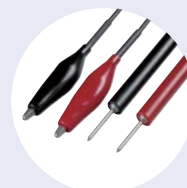
CLIP TYPE LEAD L2101 (Bundled accessory)



PIN TYPE LEAD L2102

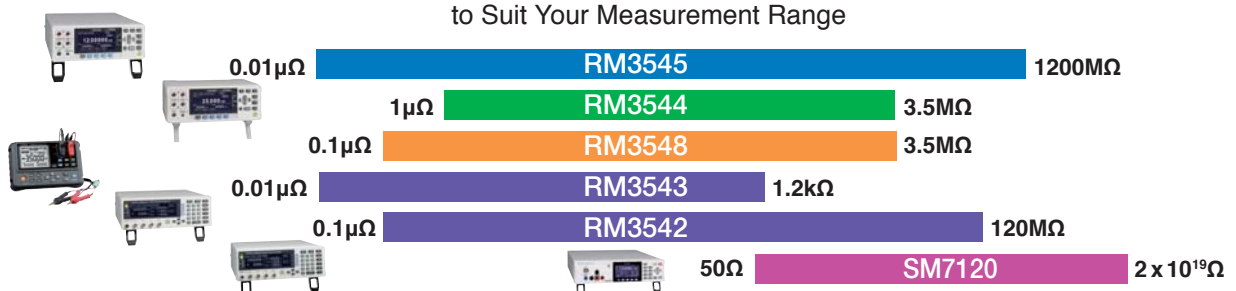


PIN TYPE LEAD L2103



4-TERMINAL LEAD L2104

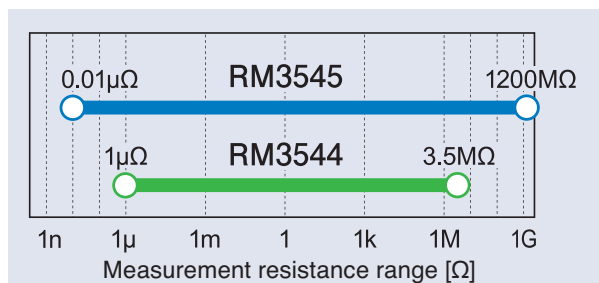
A Full Line-up of HIOKI Resistance Meters to Suit Your Measurement Range



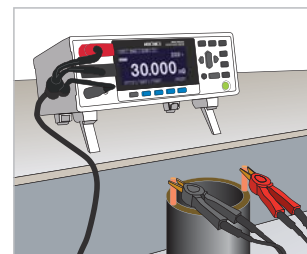
Simplifying high-accuracy resistance measurement

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

Convenient wide range options RM3545 RM3544



Integrate into automated inspection systems



Manual testing on production lines

Overview of the RM3545 RM3545

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

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.

Guaranteed accuracy with no warm up or zero-adjustment RM3545 RM3544

For the RM3545/RM3544, accuracy is guaranteed* immediately after startup, without any warm up or zero-adjustment.

*When performing measurement with the RM3545 in a temperature and humidity environment that satisfies the guaranteed accuracy conditions, an even higher level of accuracy (full accuracy) is guaranteed.

Offset Voltage Compensation (OVC) RM3545

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.

Overview of the RM3544 RM3544

Measure from 0.000mΩ to 3.5000MΩ
1μΩ max. resolution, 0.02% basic accuracy
Max. measurable current of 300mA

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.

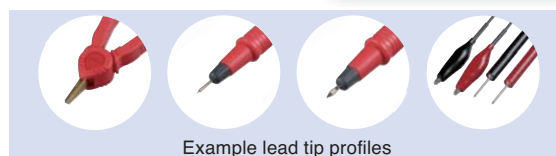
Moreover, the instruments' maximum accuracy of 0.02% allows them to be used in testing current detectors with a precision of 0.1%.

High-durability probes RM3545 RM3544

HIOKI offers a line of probes designed to accommodate the full range of measurement targets. Flex resistance has been dramatically improved (based on HIOKI comparisons).



Leads (overall view)



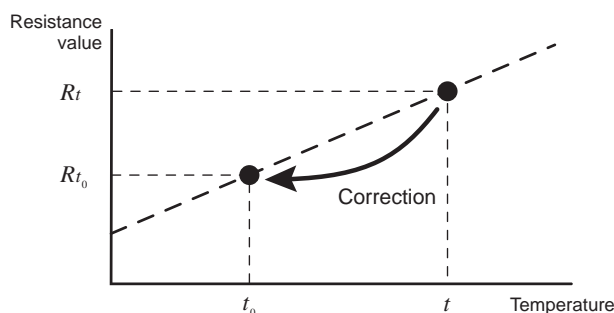
Example lead tip profiles

Temperature correction RM3545 RM3544

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).

Types of temperature input	RM3544: Temperature Sensor (Z2001) RM3545: Temperature Sensor (Z2001), Analog voltage input (from an infrared thermometer, etc.)
Reference temperature setting range	-10.0 to 99.9 °C
Temperature coefficient setting range	RM3544: -9,999 to 9,999 ppm/°C RM3545: -99,999 to 99,999 ppm/°C



Super-high-accuracy, multi-channel resistance meter for use in advanced development and production applications

Key Features of the RM3545

RM3545

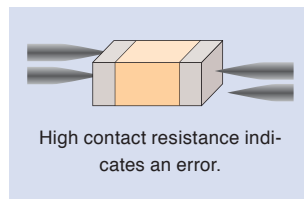


High/low current selection by range

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.

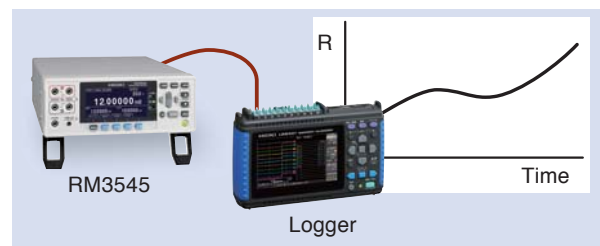


Low-power (LP) resistance measurement

The RM3545 can perform measurement at a resolution of $10 \mu\Omega$ at 1 mA (using the 1,000 m Ω 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.



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.

Multiplexer function (RM3545-02 only)

RM3545-02

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

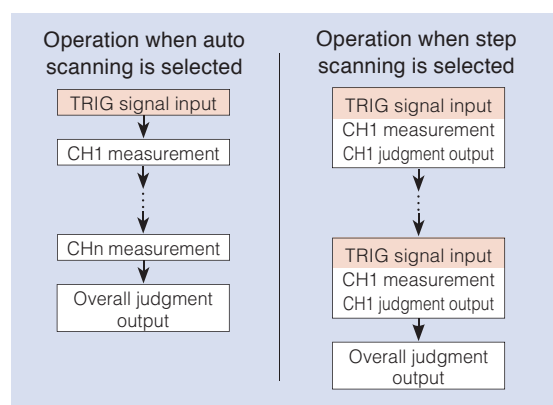
Measurement targets that are susceptible to the effects of temperature, for example thermistors and temperature transducers, can be compared with a reference element to generate a judgment.

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

RM3545

RM3544

① Guard terminals

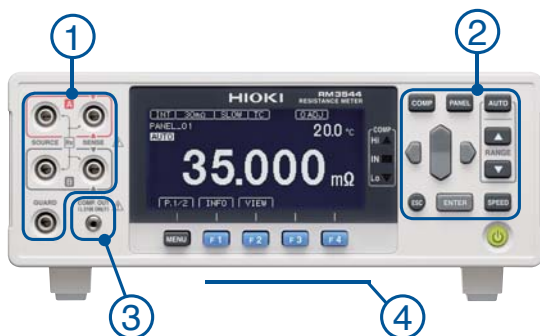
Minimize the effects of external noise on measurements.

*GUARD terminal is the shield potential.

This terminal is not for guarding network resistance measurements.

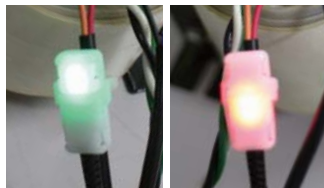
② Simple control over basic settings

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.



Green light
IN state

Red light
HI/LO state

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.

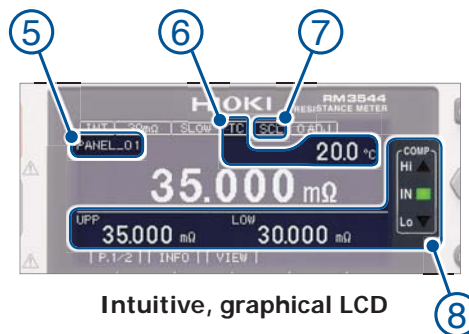
⑦ Scaling

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



Intuitive, graphical LCD

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.

High-precision specs in a compact package

RM3544

● 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.



RM3544



Easy integration into automatic testing equipment (RM3545/-01/-02, RM3544-01)

RM3545 RM3544

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^{*1} (RM3545) and 18 ms (RM3544-01). One cycle of operation, lasting from measurement to judgment output, completes within this time. ^{*1} When the measurement current is set to "High".
- 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^{*2}.
- The EXT I/O output mode can be switched between judgment mode and BCD mode.

^{*2} 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.

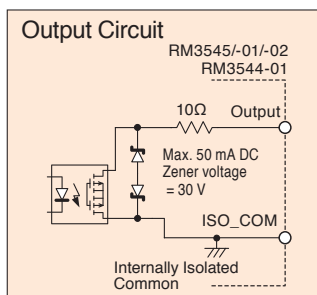
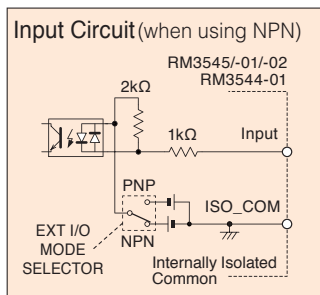
When designing a control system using the EXT I/O interface, be sure to read the instruction manual and check the necessary technical information.

EXT I/O 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 polarity (Select NPN/PNP)



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)
 DC30Vmax, DC50mAmax/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

EXT I/O Signal List

RM3545

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, IN, 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 * Indicates the nth bit of the mth digit.

RM3544-01

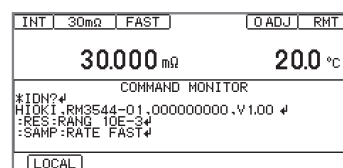
RM3544

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 * Indicates the nth bit of the mth digit.

Communications Monitor Function for smooth systems development

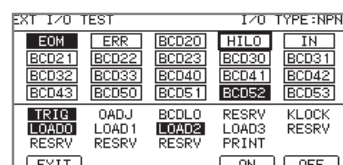
The Communications Monitor Function displays communications data (received commands and sent data) on the screen, providing valuable support for programming of programmable logic controllers (PLCs).



Communications Monitor screen

Functionality 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.

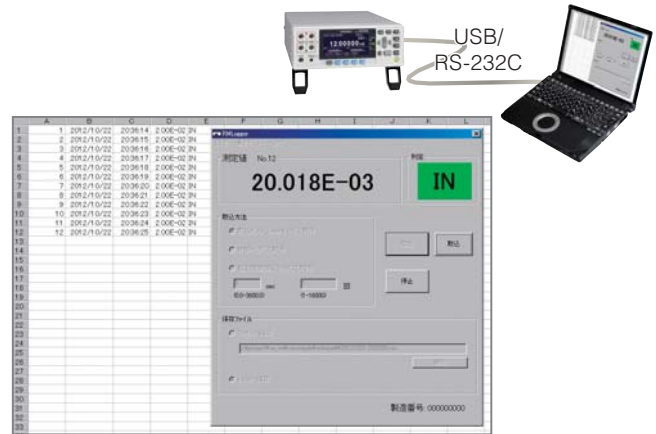


EXT I/O test function screen

● Connecting the instrument to a computer via RS-232C or USB

RM3545 RM3544

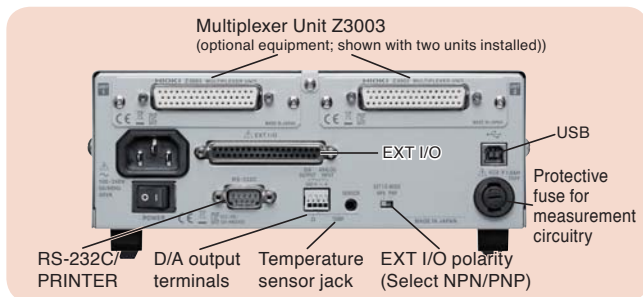
- Use a PC to control RM3545 and RM3544-01 functions as well as acquire measurement results.
(This capability does not include turning the instrument on and off or configuring certain interface settings.)
- Connect the instrument to a commercially available RS-232C printer to print measured values, including 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>).



Applications screen

● RM3545-02 rear panel

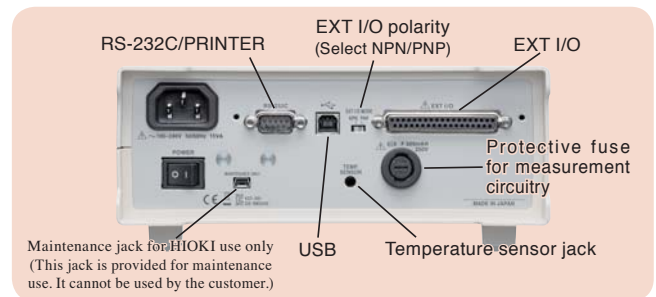
RM3545



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

● RM3544-01 rear panel

RM3544



*The RM3544 does not include EXT I/O or communication interfaces (RS-232C or USB). Select the RM3544-01 for these functions.

● Interface and EXT I/O selection

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

RM3545 RM3544

RM3545 series comparison chart		(Base model)	-01	-02
External I/O (comparator, BCD, BIN function)		✓	✓	✓
Communication interfaces	RS-232C/Printer/USB	✓	✓	✓
	GP-IB	N/A	✓	N/A
Multiplexer* (scanner function)		N/A	N/A	✓ (Max. 20 channels)

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

RM3544 series comparison chart		(Base model)	-01
External I/O (comparator, BCD)		N/A	✓
Communication interfaces RS-232C/Printer/USB		N/A	✓

■ 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 [Measurement frequency] External instrument DC, 10 Hz to 1 kHz
Contact specifications	Contact type: Mechanical relay Maximum allowable voltage: 33 V RMS and 46.7 V peak or 70 V DC *1 Maximum allowable power: 30 W (DC), (Resistance load) Contact service life: 4-wire: 50 million cycles*2 (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

RM3545-02

• About scanning time
The Z3003 switching 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.

• Example scanning times

Range	Number of channels	Measurement speed	Delay	Time to output judgment results after TRIG input (When the measurement current is set to "High".)
1000mΩ	10	FAST	0 ms	Approx. 300ms
1000mΩ	10	FAST	Preset	Approx. 800ms

*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)

	RM3545	RM3544
Measurement types	Resistance measurement: 0.000 00mΩ (10mΩ range) to 1200.0MΩ (1000MΩ range), 12 ranges Low power resistance measurement: 0.00mΩ (1000mΩ range) to 1200.00Ω (1000Ω range), 4 ranges Temperature measurement (thermistor): -10.0 to 99.9°C Temperature measurement (analog input): -99.9 to 999.9°C	Resistance measurement: 0.000mΩ (30mΩ range) to 3.500 0MΩ (3MΩ range), 9 ranges Temperature measurement (thermistor): -10.0 to 99.9°C
Measurement method	4-terminal direct current (constant current), banana plug, with guard terminal	
Range switching	Auto or Manual	
Temperature correction	Reference temperature setting range: -10°C to 99.9°C, Temperature coefficient setting range: -99,999 ppm/°C to 99,999 ppm/°C	Reference temperature setting range: -10°C to 99.9°C, Temperature coefficient setting range: -9,999 ppm/°C to 9,999 ppm/°C
Zero-adjustment	By range, by step (RM3545-02 only) Within ±50% f.s. of each range. (Zero-adjustment is not required for 100 MΩ or greater ranges.)	Within -3% to 50% f.s. of each range. (f.s.= 30,000 dgt.)
Trigger	Internal or external	RM3544: Internal trigger, RM3544-01: Internal or external
Measurement speed	FAST / MED / SLOW1 / SLOW2	FAST / MED / SLOW
Delay	Internal fixed value: / 0 to 9999 ms (1ms step)	N/A
Functions	Temperature correction, Temperature conversion, Self-calibration, offset voltage compensation (OVC), comparator (ABS/REF%), BIN, 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 Comparater Attachment output	Temperature correction, comparator (ABS/REF%), key-lock (OFF, menu lock, all lock), display digit count selection function (5 digits/4 digits), automatic power supply frequency settings (AUTO/50Hz/60Hz), scaling, judgment sound setting, auto hold, L2105 LED Comparater Attachment output
Measurement fault detection functions	Contact check, over detection, current fault detection	Over detection, current fault detection
Averaging	OFF, 2 to 100 averaging iterations (variable in 1-iteration steps)	
Panel store, panel load	30 (Front terminals), 8 (MUX (multiplexer)) Panel save parameters: save time and date, resistance measurement ranges, measurement speed, comparator, BIN setting, multiplexer setting, etc.	10 Panel save parameters: resistance measurement ranges, measurement speed, comparator, etc.
Multiplexer	RM3545-02: Number of installed units: Max. 2 Measurement terminal settings : Front terminals / MUX (multiplexer) When using the MUX setting, the measurement leads cannot be connected to the front measurement terminals Support unit: Z3003 Number of channels that can be set: 42, switching time 30 ms (reference value)	N/A
D/A output	Output: resistance measured value Output voltage: 0V DC to 1.5V DC Output impedance: 1kΩ Number of bits: 12bit	N/A
EXT I/O	TRIG and other, BIN, BCD	RM3544-01: TRIG and other, BCD
Communication interfaces	Select from GP-IB*, RS-232C, PRINTER(RS-232C), or USB *RM3545-01 only	RM3544-01: Select from RS-232C, PRINTER(RS-232C), or USB
Communication interfaces	Remote function, communications monitor function, data output function, memory (50 data)	Remote function, communications monitor function, data output function
RS-232C	Bit rates: 115,200 / 38,400 / 19,200 / 9,600 bps	
USB	Class: CDC (COM mode), HID (USB keyboard mode)	
Printer (RS-232 port)	Printed data: Resistance measurement values, temperature measurement values, judgment results, measurement conditions, statistical results Operation: Prints at PRINT signal or PRINT key input. Interval: ON/OFF, Interval times: 1 to 3,600 s (variable in 1 s steps), Number of print columns per row: 1 or 3	Printed data: Resistance measurement values, temperature measurement values, judgment results, measurement conditions
Operating temperature and humidity	0 to 40°C, 80% rh or less (non-condensating)	
Storage temperature and humidity	-10 to 50°C, 80% rh or less (non-condensating)	
Operating environment	Indoors, Pollution Degree 2, up to 2,000 m ASL	
Power supply	Rated supply voltage: 100 to 240 VAC ±10%, Rated supply frequency: 50/60 Hz	
Rated power consumption	40 VA	15 VA
Insulation withstand potential	1.62 kV AC for 1 min. (with 10 mA cutoff current), between all mains supply terminals and protective ground, interfaces, and measurement terminals	
Dimensions	Approx. 215W × 80H × 306.5D mm (8.46"W × 3.15"H × 12.07"D) (without projections)	Approx. 215W × 80H × 166D mm (8.46"W × 3.15"H × 6.54"D) (without projections)
Mass	RM3545, RM3545-01: Approx. 2.5 kg (88.2 oz) RM3545-02: Approx. 3.2 kg (112.9 oz) (not including Z3003)	RM3544: Approx. 0.9 kg (31.7 oz) RM3544-01: Approx. 1.0 kg (35.3 oz)
Accessories	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	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 *Included with RM3544-01.
Applicable standards	Safety: EN61010, EMC: EN61326, EN61000-3-2, EN61000-3-3	

Measurement accuracy

RM3545 **RM3544**

● Conditions of guaranteed accuracy

- Temperature & humidity: 23 °C ±5 °C, 80% rh or less (non-condensating)
- 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.

* During temperature correction, the value calculated below is added to the rdg. error for resistance measurement accuracy:

$$\frac{-\alpha_{t0}\Delta t}{1 + \alpha_{t0} \times (t + \Delta t - t_0)} \times 100 \quad [\%]$$

t_0 : Reference temperature. [°C]
 t : Ambient temperature. [°C]
 Δt : Temperature. measurement accuracy
 α_{t0} : Temperature. coefficient at t_0 is [1/°C]

Resistance measurement accuracy

● RM3545

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. = 10,000 dgt. and 0.01% f.s. = 1 dgt.

(Example) 0.006 + 0.001 0.006% rdg. + 0.001% f.s.

Range	100MΩ range high-precision mode	Max. measurement display ¹	Resolution	Accuracy %rdg. + %f.s. ²				Measurement current ³		Additional accuracy without 0ADJ %f.s. ²	Max open-terminal voltage	
				FAST	MED	SLOW1	SLOW2	Switching				
10mΩ	-	12.000 00 mΩ	10 nΩ	0.060+0.050 (0.060+0.015)	0.060+0.020 (0.060+0.002)	0.060+0.020 (0.060+0.001)	0.060+0.020 (0.060+0.001)	-	1A	0.020 (-)	5.5V ⁴	
100mΩ		120.000 0 mΩ	100 nΩ	0.060+0.010 (0.060+0.003)	0.060+0.010 (0.060+0.001)	0.060+0.010 (0.060+0.001)	0.060+0.010 (0.060+0.001)	High	1A	0.002 (-)		
				0.014+0.050 (0.014+0.015)	0.014+0.020 (0.014+0.002)	0.014+0.020 (0.014+0.001)	0.014+0.020 (0.014+0.001)	Low	100mA	0.020 (-)		
1000mΩ		1200.000 mΩ	1 μΩ	0.012+0.010 (0.012+0.003)	0.012+0.008 (0.012+0.001)		0.012+0.008 (0.012+0.001)		High	100mA		0.002 (-)
				0.008+0.050 (0.008+0.015)	0.008+0.020 (0.008+0.002)		0.008+0.020 (0.008+0.002)		Low	10mA		0.020 (-)
10Ω		12.000 00 Ω	10 μΩ	0.008+0.010 (0.008+0.003)	0.008+0.008 (0.008+0.001)		0.008+0.008 (0.008+0.001)		High	10mA		0.002 (-)
				0.008+0.050 (0.008+0.015)	0.008+0.020 (0.008+0.002)		0.008+0.020 (0.008+0.002)		Low	1mA		0.020 (-)
100Ω		120.000 0 Ω	100 μΩ	0.007+0.005 (0.007+0.005)	0.007+0.002 (0.007+0.001)	0.007+0.001 (0.007+0.001)		High	10mA	- (-)		
				0.008+0.010 (0.008+0.003)	0.008+0.010 (0.008+0.001)		0.008+0.010 (0.008+0.001)		Low	1mA		0.002 (-)
1000Ω		1200.000 Ω	1 mΩ	0.007+0.005 (0.007+0.005)	0.006+0.002 (0.006+0.001)	0.006+0.001 (0.006+0.001)		-	1mA	- (-)		
10kΩ		12.000 00 kΩ	10 mΩ	0.008+0.005	0.007+0.002	0.007+0.001		-	1mA	-		
100kΩ		120.000 0 kΩ	100 mΩ	0.008+0.005	0.007+0.002	0.007+0.001		-	100μA	-		
1000kΩ	1200.000 kΩ	1 Ω	0.015+0.005	0.008+0.002	0.008+0.001		-	10μA	-			
10MΩ	12.000 00 MΩ	10 Ω	0.030+0.005	0.030+0.002	0.030+0.001		-	1μA	-			
100MΩ	ON	120.000 0 MΩ	100 Ω	0.200+0.005	0.200+0.002	0.200+0.001		-	100nA	-		
	OFF	120.00 MΩ	10 kΩ	10.00MΩ or less : 0.50+0.02 10.01MΩ or more : 1.00+0.02				-	Max. 1μA	-		
1000MΩ	OFF	1200.0 MΩ	100 kΩ	100.0MΩ or less : 1.00+0.02 100.1MΩ or more : 10.00+0.02				-	1μA	-		

*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. Figures shown in parentheses on the second line indicate the additional accuracy with OVC on.

*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.

Range	100MΩ range high-precision mode	Max. measurement display ¹	Resolution	Accuracy %rdg. + %f.s. ²				Measurement current ³		Additional accuracy without 0ADJ %f.s. ²	Max open-terminal voltage
				FAST	MED	SLOW1	SLOW2	Switching			
1000mΩ	-	1200.00 mΩ	10 μΩ	0.200+0.100	0.200+0.010	0.200+0.005	0.200+0.003	-	1mA	-	20mV ⁵
10Ω		12.000 0 Ω	100 μΩ	0.200+0.050	0.200+0.005	0.200+0.003	0.200+0.002	-	500μA	-	
100Ω		120.000 Ω	1 mΩ	0.200+0.050	0.200+0.005	0.200+0.003	0.200+0.002	-	50μA	-	
1000Ω		1200.00 Ω	10 mΩ	0.200+0.050	0.200+0.005	0.200+0.003	0.200+0.002	-	5μA	-	

*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%.

*5 When the contact check function is off (when the contact check function is on, 300 mV)

Additional accuracy when using the Z3003

RM3545

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

Z3003 additional error		
Effects of leak current	Add 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.):	$\frac{1 \times 10^{-9} [A]}{I_{MEAS} [A]} \times 100 [\%rdg.]$ I_{MEAS} : Measurement current
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:	$A_{fs} \times 0.5 [\%rdg.]$ A_{fs} : f.s. error component for RM3545-02 with Z3003
Effect of offset voltage	Add the resistance shown on right to the error when OVC is OFF:	$\frac{10 \times 10^{-6} [V]}{I_{MEAS} [A]} [\Omega]$
Effect of offset resistance fluctuations	When using a 2-wire setup, add the wiring resistance shown on right to the error component.	0.1 Ω
Temperature coefficient	From 0°C to 18°C and 28°C to 40°C, add a temperature coefficient of $\pm(1/10$ of additional accuracy) / °C.	

RM3544

RM3544

Accuracy = $\pm(\% rdg. + \% f.s.)$

• f.s. = calculated 30,000 dgt., where 0.010% f.s. = 3 dgt.

(Example) 0.020 + 0.007 0.020% rdg. + 0.007% f.s.

Range	Max. measurement display ^{6,7}	FAST	MED/SLOW	Measurement Current ⁸	Open-Circuit Voltage
30m Ω	35.000 m Ω	0.030+0.080	0.030+0.070	300mA	5.5Vmax.
300m Ω	350.00 m Ω	0.025+0.017	0.025+0.014	300mA	
3 Ω	3.500 0 Ω	0.025+0.017	0.025+0.014	30mA	
30 Ω	35.000 Ω	0.020+0.010	0.020+0.007	10mA	
300 Ω	350.00 Ω	0.020+0.010	0.020+0.007	1mA	
3k Ω	3.500 0 k Ω	0.020+0.010	0.020+0.007	1mA	
30k Ω	35.000 k Ω	0.020+0.010	0.020+0.007	100 μ A	
300k Ω	350.00 k Ω	0.040+0.010	0.040+0.007	5 μ A	
3M Ω	3.500 0 M Ω	0.200+0.010	0.200+0.007	500nA	

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

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

*8 Measurement current accuracy is $\pm 5\%$.

Temperature measurement accuracy (RM3544/RM3545)

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

RM3545 RM3544

Range of guaranteed accuracy	-10.0 to 99.9 °C
Display refresh rate	Approx. 2 s
Guaranteed accuracy period	1 year

• Analog Input (for RM3545)

RM3545

Guaranteed accuracy range	0 to 2 V
Maximum allowable voltage	2.5V
Resolution	1mV
Display range	-99.9 to 999.9 °C
Measurement period (speed)	Approx. 50 ms, no moving average
Period of guaranteed accuracy	1 year
Accuracy	$\pm 1\%rdg., \pm 3$ mV

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

t: Temperature measurement values [°C]

Temperature	Accuracy
-10.0 °C to 9.9 °C	$\pm (0.55 + 0.009 \times t-10)$ °C
10.0 °C to 30.0 °C	± 0.50 °C
30.1 °C to 59.9 °C	$\pm (0.55 + 0.012 \times t-30)$ °C
60.0 °C to 99.9 °C	$\pm (0.92 + 0.021 \times t-60)$ °C

Standalone instrument accuracy: ± 0.2 °C

Resistance D/A output accuracy (RM3545)

RM3545

Output accuracy	Resistance measurement accuracy $\pm 0.2\%f.s.,$ (temperature coefficient $\pm 0.02\%f.s./^{\circ}C$)
Response time	Measurement time + Max. 1 ms

Measurement time typical values (RM3545)

RM3545

Range	Measurement current	Measurement speed				
		FAST	MED		SLOW1	SLOW2
			50Hz	60Hz		
10 m Ω	N/A	41	61	58	141	241
100 m Ω	High	41	61	58	141	241
1000 m Ω	High	2.2	22	19	102	202
10 Ω	High	2.2	22	19	102	202
100 Ω	High	2.8	23	20	103	203

Unit: ms, Tolerance: $\pm 10\% \pm 0.2$ ms

Measurement time (RM3544)

RM3544

Measurement speed			
FAST		MED	SLOW
50Hz	60Hz		
21	18	101	401

Unit: ms, Tolerance: $\pm 10\% \pm 2$ 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



Model : RESISTANCE METER RM3545

Model No. (Order Code) (Note)

RM3545

RM3545-01 (with GP-IB interface)

RM3545-02 (support for the multiplexer unit)

Accessories: Power cord x1, Clip type lead L2101 x1, temperature sensor Z2001 x1, Male EXT. I/O connector x1, Instruction manual x1, Application disc x1, USB cable (A-to-B type) x1, Spare fuse x1



Model : RESISTANCE METER RM3544

Model No. (Order Code) (Note)

RM3544

(No interfaces)

RM3544-01

(with EXT I/O, RS-232C, USB)

Accessories: [RM3544] Power cord x1, Clip type lead L2101 x1, Instruction manual x1, Spare fuse x1, [RM3544-01] Power cord x1, Clip type lead L2101 x1, Male EXT. I/O connector x1, Instruction manual x1, Application disc x1, USB cable (A-to-B type) x1, Spare fuse x1

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 mΩ HiTester 3540. Please use the test leads indicated in the RM3545 and RM3544 accessory and option documentation.

Options

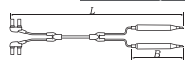
Multiplexer Unit (for RM3545-02)



MULTIPLEXER UNIT Z3003

Test Leads

Note on probe length



B: Probe length
L: Overall length



CLIP TYPE LEAD L2101

(Bundled accessory)

B: 83 mm (3.27 in), L: 1.5 m (4.92 ft)

4-TERMINAL LEAD L2104

B: 118 mm (4.65 in), L: 1.5 m (4.92 ft)

Temperature Sensor/LED Comparator Attachment



TEMPERATURE SENSOR
Z2001
(RM3545/RM3545-01/
RM3545-02 Bundled accessory,
RM3544/RM3544-01 Option)
1.75 m (5.74 ft)



LED COMPARATOR
ATTACHMENT L2105
2 m (6.56 ft)

PC Communication

RS-232C CABLE 9637
for PC connection, 9pin - 9pin, cross, 1.8 m (5.91 ft)

RS-232C CABLE 9638
for PC connection, 9pin - 25pin, cross, 1.8 m (5.91 ft)

GP-IB CONNECTOR CABLE 9151-02
2 m (6.56 ft)



PIN TYPE LEAD L2102

B: 178 mm (7.01 in), L: 1.5 m (4.92 ft)

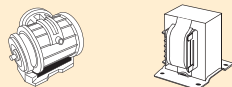


PIN TYPE LEAD L2103

B: 176 mm (6.93 in), L: 1.5 m (4.92 ft)

Related products

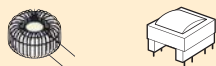
- Large motors, large transformers



- Vehicle grounding lines, conductivity of aircraft fuselages



- Temperature rise tests (Motors, choke coils, transformers)



High-accuracy portable resistance meter measures from $\mu\Omega$ to $M\Omega$



RESISTANCE METER RM3548

Basic accuracy : **0.02%**

Max. resolution : **0.1 $\mu\Omega$**

Max. measurable current : **1 A**

- Measure from 0.0 $\mu\Omega$ (@ 1 A) to 3.5 $M\Omega$
- 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>.

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

HIKI
HIKI E. E. CORPORATION

HIOKI**SUPER MEGOHM METER
SM7110, SM7120, SM7420****NEW**

300 Times Better Noise Resistance

Max. $2 \times 10^{19} \Omega$ Display
 Min. 0.1 fA Resolution
 Max. 6.4 ms Measurement Speed
 Max. 2000 V Output

SUPER MEGOHM METER SM7120



Flexible, Multipurpose Design

Electrometer
 Picoammeter
 IR Meter

Max.
 1000 V Output
SM7110

New

4CH
 Microcurrent
 Measurement
SM7420

CE

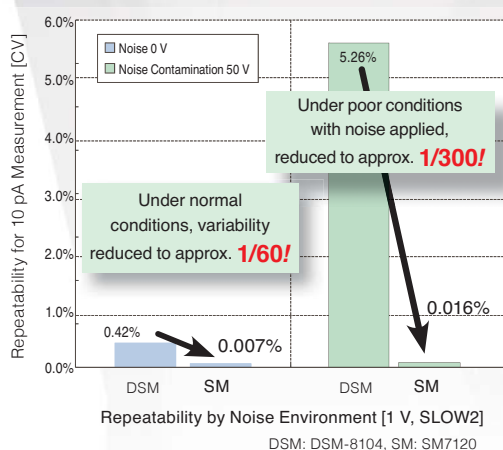
asita
 TECNOLOGIE DI MISURA

Highly stable measurements with strong noise resistance



The stability you need for high resistance measurements

1/60 Variability, 300x Noise Resistance



Advanced 2 kV floating circuitry

Stability (repeatability) against power supply noise and external noise has improved dramatically due to a combination of new Super Megohm floating circuitry and triaxial connectors. Variability in normal usage environments is reduced to 1/60 compared to previous models, and to 1/300* in conditions where 50 V noise is applied.

* Compared to legacy model, the DSM-8104



16 mm large-diameter triaxial connector

The large-diameter triaxial connector newly adopted for current input terminals has a triple coaxial structure with the internal shield connected to the GUARD (COM) line and the external shield connected to the GROUND. This achieves both stability against noise and safety during high-voltage inspections.



Supports components with high voltage resistance

2000 V / $2 \times 10^{19} \Omega$ Measurement * SM7120

Perfect for EVs and other high-voltage applications



Improved high voltage resistance and isolation performance in components are essential to meet the demands for high efficiency in recent years for applications such as automotive parts and wearable devices. The SM7120 can output 2000 V without an external power supply, ensuring that it will remain relevant even as inspection requirements expand going forward.

Model	Measurement channel	Maximum output voltage
SM7110	1ch	1000 V
SM7120	1ch	2000 V
SM7420	4ch	-----

* $2 \times 10^{19} \Omega = 20,000 \text{ P(peta) } \Omega$

Supports mass production of 1600 units/minute

Min. 6.4 ms High-Speed Inspection



6.4 ms = 4.1 ms measurement + 2.3 ms contact check

Achieve high-speed measurement with an inspection time (from TRIG input to INDEX output) of 6.4 ms when contact checks that are essential for mass production inspections are included, and 7.0 ms when comparator measurement is included.

MLCC high-speed inspection with pre-charge function *

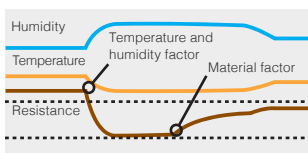
Large-capacity outputs of 2000 V/1.8 mA (SM7120 only) and 1000 V/10 mA are available, to reduce sample charging time.

[Charging terminals are equipped as standard.] The max. 50 mA/250 V pre-charge function achieves high throughput for MLCC mass production inspections. *SM7110, SM7120

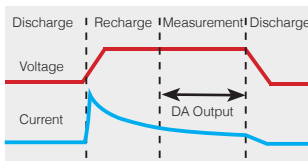
Optimal Utilities for Evaluation of New Materials



Evaluate Semiconductors and New Materials



Finding actual factors



Sequence Control (SM7110, SM7120)

[Simultaneous measurement of temperature and humidity]

Temperature and humidity must be managed together, because changes in either can affect insulation resistance. Models SM7120, SM7110 and SM7420 are equipped to perform highly accurate temperature and humidity measurements (temperature $\pm 0.5^{\circ}\text{C}$ ($\pm 0.9^{\circ}\text{F}$), humidity $\pm 5\%$ R.H.), for the measurement and management of new materials.

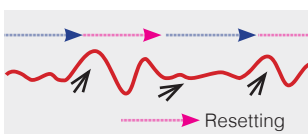
(When using the optional Z2011 HUMIDITY SENSOR: Temperature -40°C to 80°C (-40°F to 176°F), Humidity 20% to 80%)

[Sequence control] [D/A output]

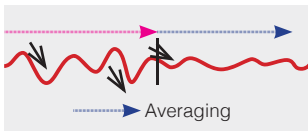
In sequence mode, set the time (max. 999.9 s) for "Discharge" - "Recharge" - "Measurement" - "Discharge", to perform repeated measurements without using a computer. During measurement, current fluctuations can also be saved to recorders from D/A output.

For even more precise evaluations, use external control such as USB to perform voltage resistance testing on semiconductors or to check the voltage dependence of new material.

Auto Average to Cancel Irregular Input



Resetting when there is a large fluctuation



Auto Averaging Image

[Auto averaging]

With the SM series, auto averaging monitors fluctuations in current and automatically determines the optimum average, so there is no need to make changes to settings while observing measurement results. Unexpected measurement fluctuations, such as transient responses in recharge current and unstable contacts with large variations, are automatically removed to achieve stable measurement results.

(An average of a specified number with fixed measurement conditions is also possible.)

[5-stage measurement speed]

Speed switches between FAST, FAST2, MID, SLOW, and SLOW2 based on environment, and can be set according to environment such as FAST2 at $\frac{1}{2}$ PLC for the internal integration time.

Save a Huge Range of Electrode Variations and Settings



[Electrode presets]

A variety of electrode and shield box presets are provided according to material.

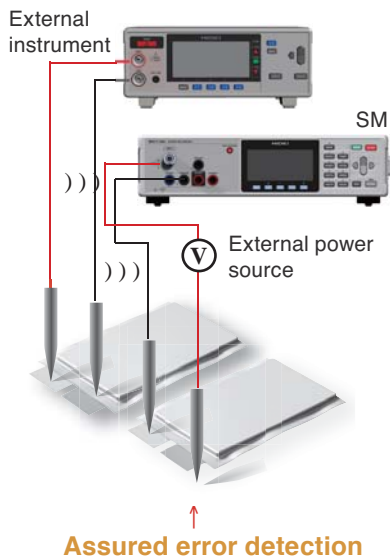
The electrode constant is set automatically by simply entering the name of the electrode to be used, allowing resistivity to be measured easily and accurately.

[Panel save/load]

Electrode names and various settings, such as the 60-second settings for sequence control, can be saved as panel data. This means that material switching can be performed easily simply by loading panel data.

Make Mass Production More Practical than Ever

High-Performance Contact Checks for Picoammeter Mode (Using External Power Source)



[Low capacity contact checks]

The SM7110/SM7120 is equipped with contact checks that can identify low-capacity capacitors of only a few pF as well as measured objects with a small capacitance. (Reference value: 0.1 pF to 99.99 pF)

[2-band selection]

As with battery production lines, select the frequency for contact checks to prevent the minute check signals on site with multiple various measuring instruments from getting crossed.

These two contact checks can also be used in picoammeter mode with an external power supply. These are high-performance contact checks that prevent unnecessary retries and excess detection due to the effects of an external power supply, and that also prevent takt reduction and worsening yield ratio.

[CH independent contact checks]

The SM7420 using an external power source enables check frequencies and delay settings to be changed for each measurement channel, achieving detailed settings that match the line design.

Faster Line Construction

EXT I/O TEST				I/O TYPE:NPN			
EOM	ERR	INDEX	C_CHK_GO	V_CHK_GO	OPEN_GO	VON	HI
IN	LO	PASS	FAIL	TRIG	START	C_CHK	STOP
V_CHK	OPEN	ILOCK	KLOCK	EXIT	ON	OFF	

EXT I/O Test

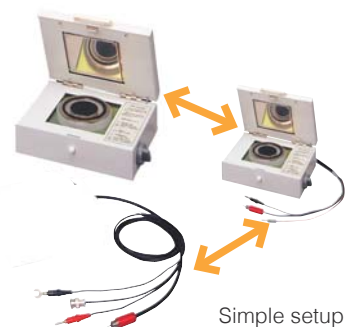
[External interfaces]

There are three types of external interface: GP-IB, RS-232C, and USB, as well as the built-in EXT I/O for easy linkage with programmable controllers.

[Communication monitor] [EXT IO test]

Because the communication monitor and EXT I/O test function can be used to assess all interfaces, work can be performed while observing operation conditions in real time as necessary during line construction.

Flexible Setup Changes



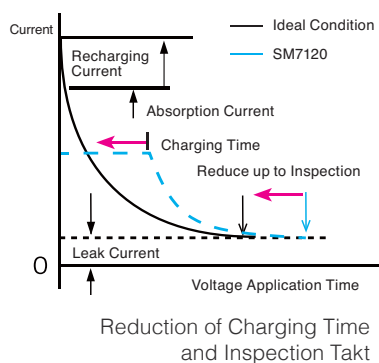
[Cable length correction]

Replace measuring cables without adjustment by simply registering the cable length. (Cable length that can be registered: 0.5 m to 3.0 m (1.64 ft to 9.84 ft)) Capacitance contact check functions that are generally included with electrometers and picoammeters will require the impedance matching to be reset whenever the cable length changes. With the SM series, replacement is possible without any adjustments.

[Jig capacity open correction]

With the SM series, open correction is provided for jig switching, for a flexible response to changes in line structure without the need for adjustments.

High-Speed Low-Current Measurement and Large-Capacity Output: Perfect for MLCC Mass Production Lines



[Input impedance 1 kΩ]

Because the SM7110, SM7120, SM7420 offers low input impedance of 1 kΩ for all current range and speed settings, there is no delay due to "settling time". This is optimal for mass production lines, because there is no reduction in speed due to switching range.

[Max. 50 mA /250 V, 1.8 mA /2000 V large capacity output, low noise]

For the insulation resistance measurement of a capacitive sample such as MLCC, charging time when voltage is applied is also important, in addition to the inspection speed. Reduced charging time allows a shorter inspection takt. The SM series has a built-in large-capacity, low-noise power supply, for reliable and even higher performance of MLCC.

Electrodes for a Variety of Materials and Uses

SURFACE/VOLUME RESISTANCE MEASUREMENT ELECTRODE SM9001

Measure sheets, film, plate products, materials, and antistatic flooring materials as they are - no need to cut samples

- Compliance Standards

JIS C2170, IEC61340-2-3

"Methods of test for determining the resistance and resistivity of solid planar materials used to avoid electrostatic charge accumulation"



Not CE
Marked

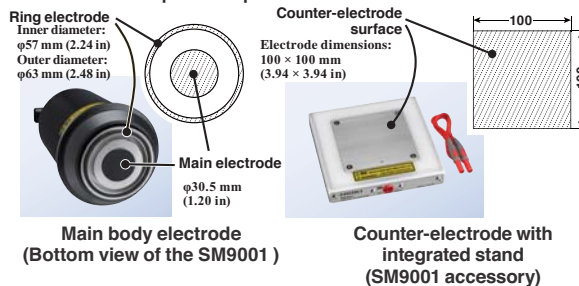
- Main body
SURFACE/VOLUME RESISTANCE MEASUREMENT
ELECTRODE SM9001

(With integrated low resistance [500 kΩ]/high resistance [1 TΩ] test surfaces)

Measure without cutting samples



- Electrode Shapes Compliant with Standards



Main body electrode
(Bottom view of the SM9001)

Counter-electrode with
integrated stand
(SM9001 accessory)

The electrode on the main body uses conductive rubber in a size conforming to standards. Just place the electrode on the sample or measurement point to make stable measurements under a load of 2.5 kg (88.2 oz). Furthermore, measurement voltage up to 1000 V enables highly accurate measurements.

- Test Before Use With the SM9002
Verification Fixture for Surface
Resistance Measurement (Optional)

The SM9002 Verification Fixture for Surface Resistance Measurement (optional) allows you to check the operation of the electrode to increase the reliability of measurement results.

Verification Fixture for Surface
Resistance Measurement
SM9002



When using the SM9002

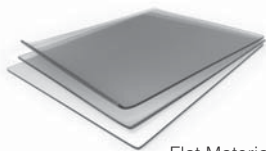
- Options
VERIFICATION FIXTURE FOR SURFACE
RESISTANCE MEASUREMENT SM9002

(With integrated low resistance [500 kΩ]/high resistance [1 TΩ] test surfaces)

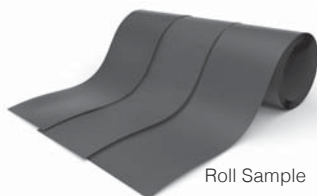
* When connecting electrodes and shield boxes to SM7110/SM7120, note that CONVERSION ADAPTER Z5010 or a change of connectors is required.

- Resistivity Measurement

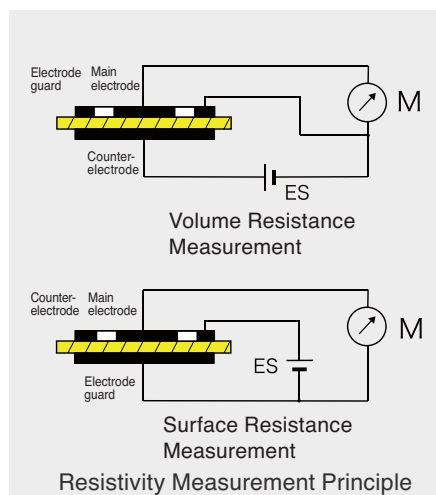
Resistivity (specific resistance) is measured to determine the quality of an insulating material. Resistivity can be classified as volume resistivity or surface resistivity, respectively indicated by the resistance between two sides relative to that of a 1 cm³ cube, or by the resistance relative to that of a 1 cm² surface. HIOKI's super megohm meter SM series provides a wide variety of electrodes to ensure easy measurement regardless of sample material or condition.



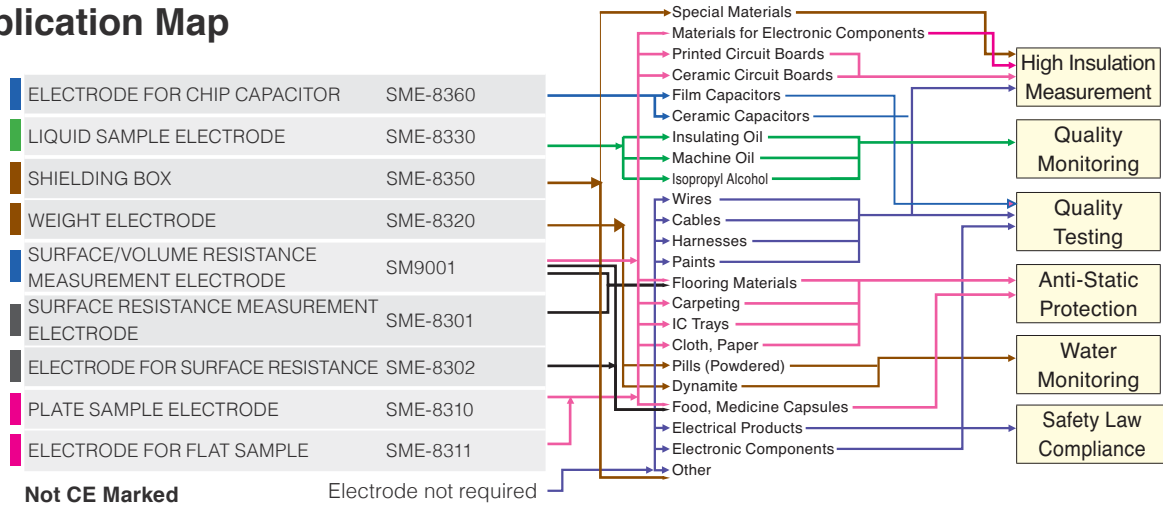
Flat Material



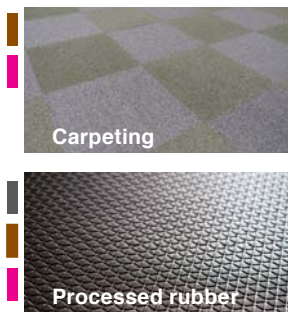
Roll Sample



Application Map



When connecting electrodes and shield boxes to SM7110/SM7120, note that CONVERSION ADAPTER Z5010 or a change of connectors is required.



SHIELDING BOX SME-8350

This is used as a sample accommodation box during measurement of a high-insulation resistance samples, or inductive or capacitive samples to perform electromagnetic shielding. When used in combination with mass electrode SME-8320, the electrode can be used as a counter electrode or a guard electrode.

When measuring electronic components such as capacitors and transducers, external noise and leakage currents are prevented to ensure stable measurement.

Accessories: Rubber sheet

Dimensions: 250 mm (9.84 in) W × 100 mm (3.94 in) H × 200 mm (7.87 in) D, **Lead length:** 80 cm (2.62 ft)

* Connection option for SM7110 and SM7120 **Interlock connection cable DSM8104F**

ELECTRODE FOR CHIP CAPACITOR SME-8360

This electrode is for measuring the insulation resistance of chip capacitors, **with an adjustable jig from 0 mm to 11 mm (0 in to 0.43 in).** An interlock connection cable is connected to the main unit, so that measurement voltage becomes "OFF" while the lid is open to ensure safety.

Dimensions: 200 mm (7.87 in) W × 52 mm (2.05 in) H × 150 mm (5.91 in) D, **Lead length:** 85 cm (2.79 ft)

MASS ELECTRODE SME-8320

This is an electrode for plate samples for use together with SHIELDING BOX SME-8350. **This electrode enables extremely easy measurement of surface and volume resistivity even on carpets and other coarse surfaces.** The main electrode dia. is 50 mm (1.97 in), and the ring electrode inner dia. and outer dia. are 70 mm (2.76 in) and 80 mm (3.15 in), respectively. A jig that holds the electrodes in a concentric arrangement and two banana clips are also included.

Combined with SHIELDING BOX (SME-8350)

LIQUID SAMPLE ELECTRODE SME-8330

An **electrically guarded** electrode for liquid samples. * Inspection data sheet included Measure resistance up to 10¹⁹ Ω·cm (at 1000 V).

Total volume: 25 mL
Capacitance between main and counter electrode: Approx. 45 pF
Electrode constant: Approx. 500 cm (16.41 ft)
Distance between electrodes: 1 mm (0.04 in)

Dimensions: φ 36 × 140 mm (1.42 × 5.51 in)
JIS C 2101 compliant

Accessories: Connection cable 60 cm (1.97 ft) length Red:0GA00029, Black:0GA00030

ELECTRODE FOR FLAT SAMPLE SME-8311

An electrode for measuring the resistivity of plate samples. Samples of 40 to 100 mm (1.57 to 3.94 in) square by up to 8 mm (0.31 in) in thickness are measurable. **The main electrode dia. is 19.6 mm (0.77 in) and inner & outer dia. of the ring electrode are 24.1 mm (0.95 in) & 28.8 mm (1.13 in), respectively.** The fundamental specifications are the same as SME-8310.

Dimensions: 215 mm (8.46 in) W × 78 mm (3.07 in) H × 165 mm (6.50 in) D, **Lead length:** 75 cm (2.46 ft)

* Connection option for SM7110 and SM7120 **Interlock connection cable DSM8104F**

SURFACE RESISTANCE MEASUREMENT ELECTRODE SME-8301

Simply press the tips of the electrode onto the sample to measure surface resistance. Use this to measure the surface resistance of samples used for static electricity measures. Measure resistance up to 1011 Ω.

Dimensions: φ60 × 50 mm (2.36 × 1.97 in), **Lead length:** 1 m (3.28 ft)

ELECTRODE FOR FLAT SAMPLE SME-8310

An electrode for measuring the resistivity of plate samples. Samples of 100 mm (3.94 in) square by up to 8 mm (0.31 in) in thickness are measurable. **The main electrode dia. is 50 mm (1.97 in) and inner & outer dia. of ring electrode are 70 mm (2.76 in) & 80 mm (3.15 in), respectively.** An interlock connection cable is connected to the main unit, so that measurement voltage becomes "OFF" while the lid is open to **ensure safety.** A selector switch allows selection of volume resistivity or surface resistivity.

Dimensions: 215 mm (8.46 in) W × 78 mm (3.07 in) H × 165 mm (6.50 in) D, **Lead length:** 75 cm (2.46 ft)

* Connection option for SM7110 and SM7120 **Interlock connection cable DSM8104F**

SURFACE RESISTANCE MEASUREMENT ELECTRODE SME-8302

An electrode for surface resistance of **curved samples and small samples**, such as resin and rubber processed goods. Surface resistance can be measured by pressing the rubber tips at the tip onto the sample. Measure electrodes up to 1011 Ω at 10 mm intervals or greater.

(Distance between electrodes: 4 mm (0.16 in))

Dimensions: φ 40 × 115 mm (0.16 × 4.53 in), **Lead length:** 1 m (3.28 ft)

General Specifications

Basic Specifications

Operating environment	Indoors, pollution degree 2, altitude up to 2000 m (6562 ft)
Operating temperature and humidity range	0°C to 40°C (32°F to 104°F), 80% RH or less, no condensation
Storage temperature and humidity range	-10°C to 50°C (14°F to 122°F), 80% RH or less, no condensation
Power supply/Maximum rated power consumption	100 V to 240 V AC (50 Hz/60 Hz): 45 VA
Dielectric withstand voltage	4000 V AC, sensed current: 10 mA Between all mains supply terminals and protective ground, interfaces, and measurement jacks
Compliance standard	EMC:EN61326 Safety:EN61010
Dimensions/mass	SM7110/SM7120 : 330 mm (12.99 in) W × 80 mm (3.15 in) H × 450 mm (17.72 in) D, 5.9 kg (208.1 oz) SM7420 : 330 mm (12.99 in) W × 80 mm (3.15 in) H × 450 mm (17.72 in) D, 6.5 kg (229.3 oz)
Accessories	Power cord ×1, Instruction manual ×1, CD-R (Communications command instruction manual, USB driver) EXT I/O male connector ×1 SM7110/SM7120: Short plug ×1

Measurement Specifications

Parameter	SM7110 / SM7120	SM7420
Measurement channel	1ch	4ch
Measurement parameter	DC current, DC voltage, temperature, humidity	DC current, temperature, humidity
Applied voltage	SM7110:0.1 V to 1000.0 V SM7120:0.1 V to 2000.0 V	-----
Measurement method	Current measurement method through application of constant voltage to measured object	Ammeter
Warning display	Voltage output value: Red LED comes on when approx. 30 V or higher	-----
Current input terminals	Triaxial BNC connector	Triaxial BNC connector
Voltage output terminal	Banana terminal	-----
COM terminal	-----	Banana terminal
Charge voltage output terminal	Banana terminal	-----
GUARD terminal	Banana terminal	-----
Interlock Input Terminal	BNC terminal	-----
Max. rated voltage to ground	2000 V DC	
Ammeter input resistance	1 kΩ ±10%	
Display refresh rate	200 ms ±5 ms (display refreshment can be turned ON/OFF during measurement.)	
Display unit	Monochrome graphic LCD	
Accuracy guarantee conditions	Guaranteed accuracy period	1 year
	Guaranteed accuracy period after adjustment made by Hioki	1 year
	Accuracy guarantee temperature and humidity range:	23°C ±5°C (73°F ±9°F), 80% RH or less
	Warm-up time:	30 min. or more
	Power supply frequency range	50/60 Hz ±2 Hz
Temperature coefficient	Add ±(measurement accuracy × 1/10)/°C for the following ranges: 0°C to 18°C (32°F to 64°F) and 28°C to 40°C (82°F to 104°F).	

Functional Specifications

Parameter	SM7110 / SM7120	SM7420
Measured value display mode	Display 1: Select one of the following: Resistance/current/surface or volume or liquid resistivity	○
	Display 2: Measurement voltage (voltage monitor)	×
Voltage output function	Display method: EXT (index display) or UNIT (units display), Number of significant figures: 3 to 6	○
	Sink/source (supports recharging and discharging) Selection when output is OFF: Discharge/high impedance (Hi-Z)	×
Voltage for resistance calculation	Select from the following: V.MONI (voltage measurement value)/MES.V (voltage setting value)/EXT.V (voltage setting value for calculation)	EXT.V only
Delay Function	Time from trigger input until start of measurement	Shared for all channels
Averaging Function	Measurement value averaging (OFF / ON / AUTO) ON 2 to 255 AUTO Automatically changes the number of averaging iterations based on the amount of change in the measurement value	Shared for all channels
	Self-Calibration	Set time: 1 s to 600 s *Automated when the power is turned on
Cable length correction function	Correction range 0.5 m to 3.0 m (1.64 ft to 9.84 ft)	Each CH
Jig Capacity	Display range: 0.00 pF to 99.99 pF	Each CH
Open Correction Function	Capacity measurement accuracy ±(20% rdg. ±0.1 pF)	
Contact Check Function	Capacitance measurement method using high-frequency signals Display range: 0.000 pF to 99.999 pF Measurement frequency: 300 kHz / 245 kHz	Each CH
Comparator Function	Determine with dgt. value (Hi, IN, Lo)	○
Sequence Program	Executes the Discharge - Recharge - Measurement - Discharge pattern in order Measurement: 1 ms to 999.9 s, Other than measurement: 0 ms to 999.9 s	×
Other functions	Judgment sound setting function, interlock function, reset, self-test	○ Interlock function ×

Accuracy Specifications

Accuracy guaranteed for 1 year; Post-adjustment accuracy guaranteed for 1 year
 * The 2000 V range is for the SM7120 only. Note that the voltage resistance for the electrodes will be 1000 V.

Current measurement accuracy

Range	Max. display	Resolution	Current measurement accuracy (±% rdg. ± dgt.)			
			FAST / FAST2	MED	SLOW	SLOW2
20 pA	19.9999 pA	0.1 fA	–	–	2.0+450	2.0+30
200 pA	199.999 pA	1 fA	–	1.0+600	1.0+45	1.0+30
2 nA	1.99999 nA	10 fA	0.5+600	0.5+40	0.5+30	0.5+20
20 nA	19.9999 nA	100 fA	0.5+30	0.5+20	0.5+15	0.5+10
200 nA	199.999 nA	1 pA	0.5+30	0.5+20	0.5+15	0.5+10
2 µA	1.99999 µA	10 pA	0.5+30	0.5+20	0.5+15	0.5+10
20 µA	19.9999 µA	100 pA	0.5+30	0.5+20	0.5+15	0.5+10
200 µA	199.999 µA	1 nA	0.5+30	0.5+20	0.5+15	0.5+10
2 mA	1.99999 mA	10 nA	0.5+30	–	–	–

Measurement Time: INDEX time (When contact checks are ON)

Measurement speed (internal integration time)	Power supply frequency	
	50 Hz	60 Hz
FAST	2 ms	6.4 ms
FAST2	0.5 PLC	16.0 ms
MED	1 PLC	26.0 ms
SLOW	4 PLC	112.0 ms
SLOW2	13 PLC	322.0 ms

PLC: Power Line Cycle

Temperature/Humidity Measurement Accuracy

When used together with the Z2011 HUMIDITY SENSOR

Temperature accuracy range	-40.00°C~80.00°C ±0.5°C
Humidity accuracy range	20.0% RH to 80.0% RH ±5 RH

Resistance accuracy

Current measurement accuracy + voltage measurement accuracy
 Accuracy is not guaranteed if the voltage setting value is selected to calculate resistance.

Resistance display range	50 Ω to 2×10 ¹⁹ Ω
Resistivity display range	50 Ω to 9.99999×10 ²⁰ Ω

Example measurement time

Contact check (2.3 ms)	Comparator (0.2 ms)	Measurement speed (Power supply frequency)					
		FAST (50 Hz)			FAST2 (60 Hz)		
		INDEX	EOM	EOM (SM7420)	INDEX	EOM	EOM (SM7420)
OFF	OFF	4.1 ms	4.5 ms	5.4 ms	12.7 ms	13.1 ms	14.0 ms
OFF	ON	4.1 ms	4.7 ms	5.6 ms	12.7 ms	13.3 ms	14.2 ms
ON	OFF	6.4 ms	6.8 ms	7.7 ms	15.0 ms	15.4 ms	16.3 ms
ON	ON	6.4 ms	7.0 ms	7.9 ms	15.0 ms	15.6 ms	16.5 ms

INDEX time : Contact check time + Delay time + Measurement time

EOM time : INDEX + Comparator measurement time + 0.4 ms * Add 1.0 ms if calculating the resistance from the voltage measurement

EOM (SM7420) : INDEX + Comparator measurement time + 1.3 ms

SM7110 / SM7120 Voltage specifications * SM7420 cannot generate or measure voltage.

Voltage measurement accuracy

Range	Max. display	Resolution	Voltage measurement accuracy (±% rdg. ± dgt.)
10 V	10.000 V	0.001 V	0.03+2
100 V	100.00 V	0.01 V	0.03+2
1000 V	1000.0 V	0.1 V	0.03+2
2000 V*	2000.0 V	0.1 V	0.2+2

Voltage Generation Accuracy Setting when output is OFF: Discharge or Hi-Z

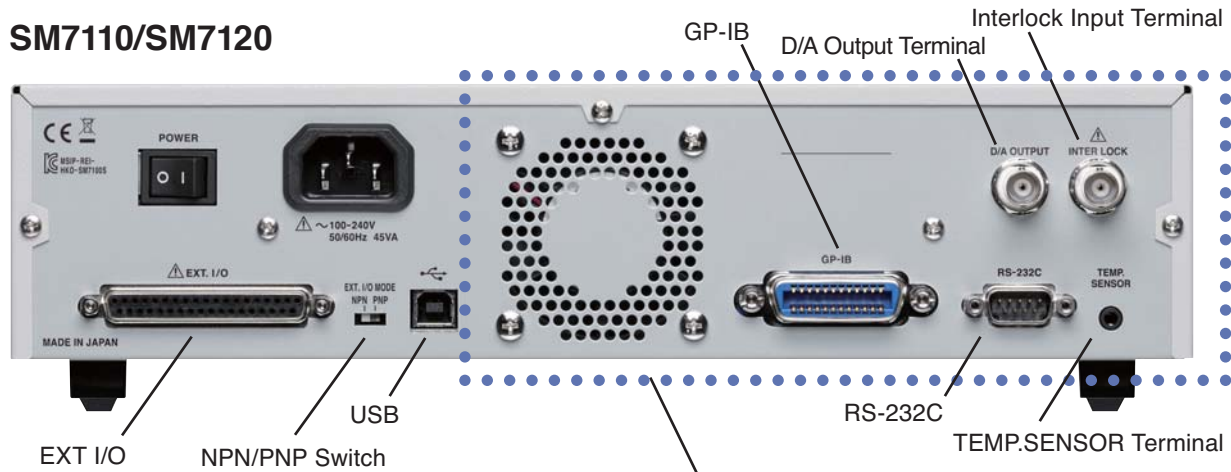
Range	Setting voltage range	Setting resolution	Voltage generation accuracy (±% setting. ±% f.s.)	Time from the START signal until voltage output
10 V	0.1 V to 10.0 V	0.1 V	0.1+0.05	0.1 ms max.
100 V	10.1 V to 100.0 V	0.1 V	0.1+0.05	0.1 ms max.
1000 V	101 V to 1000 V	1 V	0.1 +0.05	0.1 ms max.
2000 V*	1001 V to 2000 V	1 V	0.2 +0.10	0.1 ms max.

Voltage Generation Current Limiter

Recharge setting	Setting voltage range	As per settings	Total current	Current value	
				Measurement	Recharge
ON	0.1 V to 250.0 V	50 mA	50 mA	5 mA	45 mA
		10 mA	10 mA	5 mA	5 mA
		5 mA	5 mA	5 mA	0 mA
		10 mA	10 mA	5 mA	5 mA
		5 mA	5 mA	5 mA	0 mA
OFF	251 V to 1000 V	1.8 mA	1.8 mA	1.8 mA	0 mA
		50 mA	50 mA	50 mA	0 mA
		10 mA	10 mA	10 mA	0 mA
		5 mA	5 mA	5 mA	0 mA
		10 mA	10 mA	10 mA	0 mA
OFF	1001 V to 2000 V*	5 mA	5 mA	5 mA	0 mA
		10 mA	10 mA	10 mA	0 mA
		5 mA	5 mA	5 mA	0 mA
		10 mA	10 mA	10 mA	0 mA
		1.8 mA	1.8 mA	1.8 mA	0 mA

External Interface

SM7110/SM7120



EXT I/O Interface (with test function)

You can use the rear panel's switch to select either the NPN type (which supports sink output) or the PNP type (which supports source output) for the input signal polarity to match the programmable controller's common polarity.



NPN/PNP Switch

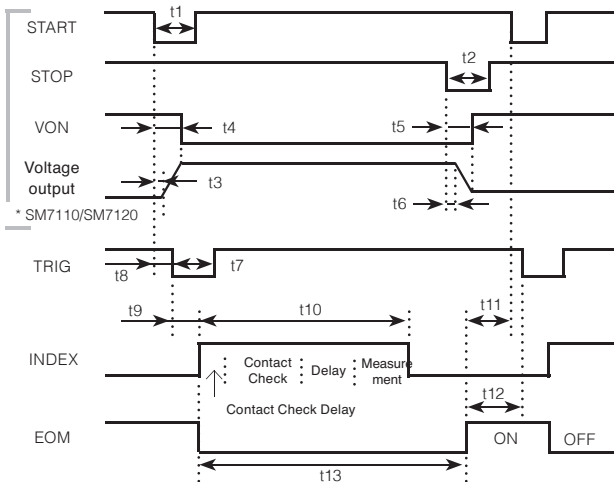
Connector

Connector used : 37-pin D-sub female connector with #4-40 inch screws (on the main unit)

Compatible connectors : DCSP-37P-ULR (solder type), DCSP-JB37PR (crimped type)
Japan Aviation Electronics Industry, Ltd.

Input Signals	Input type	Photocoupler isolation: Non-voltage contact inputs (Current sync output supported) (negative logic)
	Input ON voltage	1 V or less
	Input OFF voltage	OPEN (Shield current: 100 μ A or less)
Output Signals	Output type	Photocoupler isolation: Open drain npn output (non-polar)
	Max. load voltage	30 V
	Max. output current	50 mA/ch
Built-in insulation power	Residual voltage	0.5 V (10 mA), 1.0 V (50 mA)
	Output voltage	Sink output support: +5.0 V \pm 10% Source output support: -5.0 V \pm 10%
	Max. output current	100 mA
	External power input	Limit
	Isolated	Floating from protective ground potential and measurement circuitry
	Insulation rating	Terminal-to-ground voltage: 50 V DC, 33 V rms AC, 46.7 V peak AC or less

Dynamic Chart (Voltage output, External trigger measurement)



t0: 0.1 ms or greater, t1: 0.1 ms or greater, t3(t6): delay, t7: 0.1 ms or greater
t4 (t5): Voltage output (stop) time: Less than 0.1 ms, t8: Trigger accepted: 0 s or greater
t9: INDEX, EOM delay time, t10: INDEX time, t11: START setup time: 4 ms or greater
t12: TRIG setup time: Display ON (40 ms or greater) Display OFF (1 ms or greater)
t13: EOM time

SM7420

COM terminal for connecting external power source on rear (Measurement GROUND)



Communication Monitor

Monitor the USB, RS-232C, and GP-IB transmission contents on the panel.

GP-IB Interface

Communication method	IEEE-488.2 compliant Interface function SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0
Addresses	0~30

RS-232C Interface

Connector	9-pin D-sub male connector with #4-40 inch screws
Communication method	Full duplex, start stop synchronization, stop bit of 1 (fixed), data length of 8 (fixed), no parity, no flow control
Communication speed (bps)	4800 / 9600 / 19200 / 38400 / 115200

USB Device

Connector	Series B receptacle
Electrical specifications	USB2.0 (Full-speed)
Class	CDC class (COM mode) HID class (USB keyboard mode)

D/A Output

Output terminal	BNC terminal
Output voltage	0 V to 2 V DC: 2.0 V at current range F.S. (Select the output ch. for the SM7420)
Output impedance	1 k Ω

Interlock Input (SM7110/SM7120)

Input terminals	BNC terminal (Parallel with the EXT I/O terminal)
Interlock operation	When this setting is enabled, interlock is disengaged when Lo is input or when there is a short circuit between terminals.
Operation when the function is enabled	Output and measurement of the measurement voltage are stopped. Measurement is not possible by key or communication.

TEMP.SENSOR Terminal

Input sensor	Z2011 HUMIDITY SENSOR
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COM Terminal (SM7420)

Input terminals	Banana terminal
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Model: SUPER MEGOHM METER SM7110 SUPER MEGOHM METER SM7120 SUPER MEGOHM METER SM7420

Model No. (Order Code)	Measurement channel	Maximum output voltage	Remarks
SM7110	1ch	1000 V	
SM7120	1ch	2000 V	
SM7420	4ch	-----	Dedicated microcurrent measurement

Measurement probe not included with main unit. Please purchase an optional probe that matches your measurement application.

Options

Probes



PIN TYPE LEAD (RED) L2230
Cable length: 1 m (3.28 ft)



PIN TYPE LEAD (BLACK) L2231
Cable length: 1 m (3.28 ft)



CLIP TYPE LEAD (RED) L2232
Cable length: 1 m (3.28 ft)



CLIP TYPE LEAD (RED) L2233
Cable length: 1 m (3.28 ft)



OPEN LEAD (RED) L2234
Cable length: 3 m (9.84 ft)



OPEN LEAD (RED) L2235
Cable length: 3 m (9.84 ft)



HUMIDITY SENSOR Z2011
HUMIDITY SENSOR
Cord length: 1.5 m (4.92 ft)

STANDARD RESISTOR SR-2



A resistor box for calibration of the super megohm meters.
It uses a structure that ensures a guard.
Max. voltage: 1000 V DC
Resistance: 10 to 10,000 MΩ (24 points)
CONVERSION ADAPTER Z5010 required.
Dimensions: 270 mm (10.63 in) W × 90 mm (3.54 in) H × 195 mm (7.68 in) D
* Inspection data sheet included

Communication Interfaces

RS-232C CABLE 9637

9pin-9pin, cross
Cord length: 1.8 m (5.91 ft)

RS-232C CABLE 9638

9pin-25pin, cross
Cord length: 1.8 m (5.91 ft)

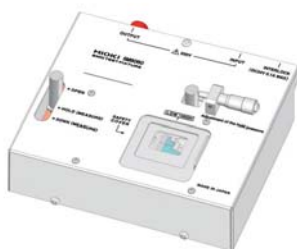
GP-IB CONNECTION CABLE 9151-02

Cord length: 2 m (6.56 ft)

Contact your local Hioki distributor for information about the pricing and specifications for the CONVERSION ADAPTER Z5010.

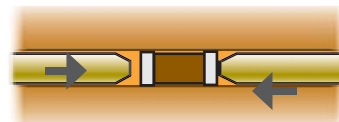
Supports 0201 Size Packages* Electrode for SMD Samples SM9060

Fine chip electrode with floating structures that can ignore jig surface resistance * EIA SIZE: 008004



Operability

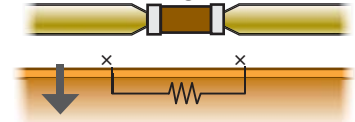
Simple chuck for size 0201



The fine chip is easily secured via the groove, and a dedicated wire probe firmly holds the sample.

Measurement Performance

Accurate measurement due to floating structures



During an inspection, the stage lowers so that the surface resistance of the jig can be ignored, allowing the sample to be measured accurately.

MLCC Dedicated Leakage Current Test System

SUPER MEGOHM METER SM7420 (4CH) / SM7810 (8CH)
POWER SUPPLY UNIT SM7860



Provides Maximum Throughput for MLCC Tests

Characteristics of the MLCC Leakage Current Test System

This high-speed test system combines the 4ch microcurrent SUPER MEGOHM METER SM7420 with an external power source, or the 8ch SUPER MEGOHM METER SM7810, developed for leakage current tests, with a 32ch output POWER SUPPLY UNIT SM7860.

Perfect for equipping on automated machines, use this to construct the fastest MLCC leakage current inspection line.



8CH Leakage Current Test System

- The SUPER MEGOHM METER SM7810 achieves the fastest MLCC leakage current inspection line in the industry with **8ch simultaneous measurement up to a speed of 6.8 ms**, as well as **reduces automated machine takt time** to contribute to cost reduction for an MLCC super-mass production line.
- Select a POWER SUPPLY UNIT SM7860 based on maximum applied voltage and functionality to support all kinds of inspection lines including recharging and discharging.

■ SM7810 Specifications



No. of channels	8ch
Measurement method	Applies voltage to measured object and measures current
Applied voltage	Supplied from external power source (voltage input terminal on rear)
Ammeter input resistance	1 kΩ
External interfaces (Criteria setting, Operation)	GP-IB, RS-232C, EXT I/O (Excluding GP-IB address settings, all criteria settings / operations executed via external interface.)
Measured value display mode	Resistance / Current
Measurement speed	FAST, MED, SLOW, SLOW2
Measurement range	Current: 1 pA to 1 mA, Resistance: $1 \times 10^2 \Omega$ to $1 \times 10^{15} \Omega$
Range switching	HOLD / AUTO
Trigger delay	0 ms to 9999 ms (Resolution: 1 ms)
Averaging function	Averaging method: Moving average, OFF / ON (1 to 255) / AUTO
Measurement voltage setting	0.1 V to 1000.0 V (Resolution: 0.1 V)
Measurement comparison / Determination function	Compares measurement to reference value Determination: HI, IN, LO Setting scope of reference value: $-9.9999E30$ to $9.9999E30$
Function	Contact check function / Jig capacity open correction function / Jig resistance open correction function

■ SM7860 Specifications



I/O terminal	Voltage output terminal (rear): Round special connector (8ch support)
External interfaces (Criteria setting, Operation)	GP-IB, RS-232C, EXT I/O (Excluding GP-IB address settings, all criteria settings / operations executed via external interface.)
Supported models	SUPER MEGOHM METER SM7810
Function	Voltage output
Operation method	Sink/source, supports recharging and discharging
Generation control	Output when OUTPUT signal of EXT I/O is ON
Output ON/OFF	Settable for individual channels
Voltage error alarm	Generates alarm when monitored voltage is outside set range, Valid setting range: ± 2 to $\pm 19\%$ (Resolution: 1%)
Current limit	Limit method: Limit independent on each channel Current limit direction: Current limit possible in both directions
Voltage monitor	Measures and displays output voltage for each system
Limitations	Voltage application object: Multi-layer ceramic capacitors Number of recharging channels: Within 8ch/system Operation criteria: Limitation on recharging interval

For detailed specifications, refer to the unit catalog, "SUPER MEGOHM METER SM7810 / POWER SOURCE UNIT SM7860."

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

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TECNOLOGIA

HIOKI

Le tecnologie di misura Hioki sono ampiamente e globalmente utilizzate per manutenzione, controllo qualità, ricerca e sviluppo, in ambito industriale, aziendale e delle infrastrutture, contribuendo alla sicurezza ed alla protezione del nostro vivere quotidiano.

L'azienda supporta inoltre lo sviluppo delle tecnologie di nuova generazione nei settori automotive ed energie rinnovabili, favorendo la diffusione di prodotti di elevata qualità a prezzi competitivi.

La mission di Hioki è di produrre e divulgare tecnologie di misura volte a proteggere la sicurezza delle persone e consentire, attraverso il supporto alla ricerca, il progresso della scienza e della tecnica.



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