HIOKI

RESISTANCE METER
RM3542A, RM3542

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)



CE

3 year Warranty

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

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

150 Ω Measurement Comparison

Example of Reduced Variation with the New Range

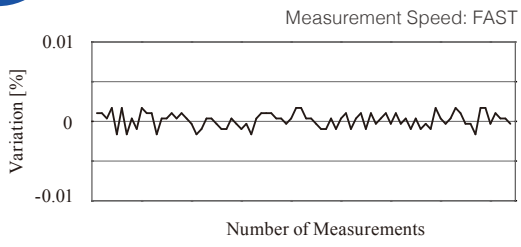
Comparison data with the same sample

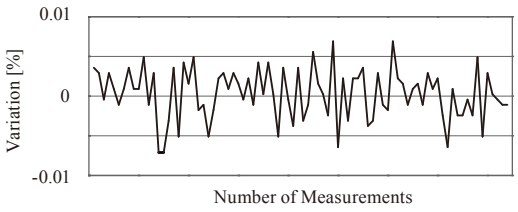
New concept

300 Ω Range

1000 Ω Range

Measurement Speed: FAST



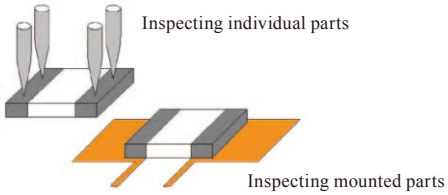


Scaling Function Used to Compensate for Mounted State

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 × 0.125 mm) resistors.

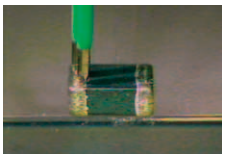
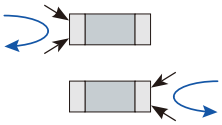


Image of Contact

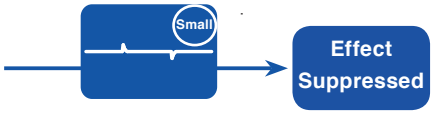
Contact Improvement by Suppressing Characteristic Changes in Ferrite Beads

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

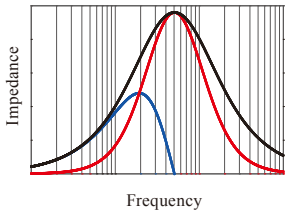


Rush current into samples is reduced.

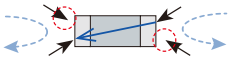
Image of Rush Current



Impedance Characteristics

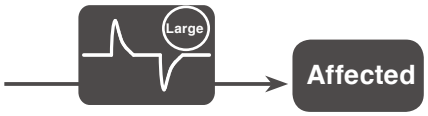


RM3542 : Simultaneous Contact Improvement on the H Side and L Side

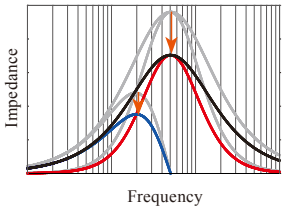


If the probe has poor contact, rush current flows into the sample.

Image of Rush Current



Impedance Characteristics



[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 × 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 × 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
:	:	:

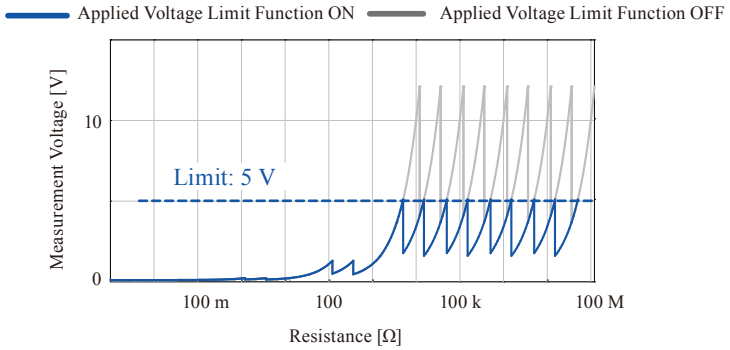
No Limit

Applied Voltage Limit Function: ON

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

RM3542A RM3542 Shared Features

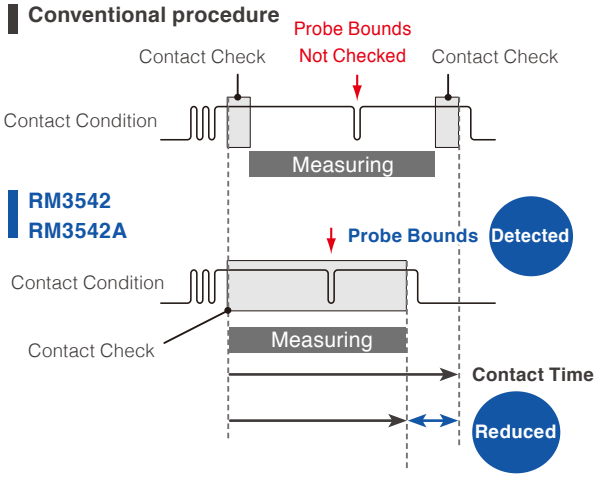
Perfect for Automation

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.

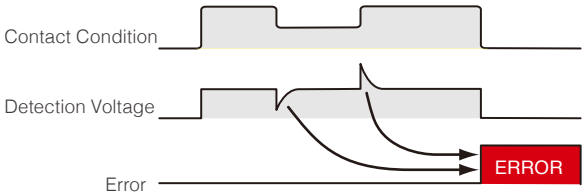
Conventional procedure



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.



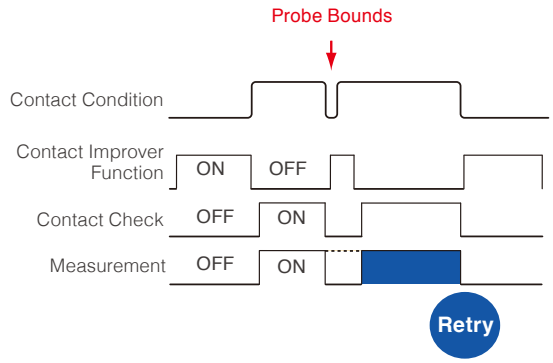
Probe contact chattering
Probe deterioration
External noise

▶ Notification on C.E.Volt display
ERR Notification by outputting a signal

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.



Productivity Improved

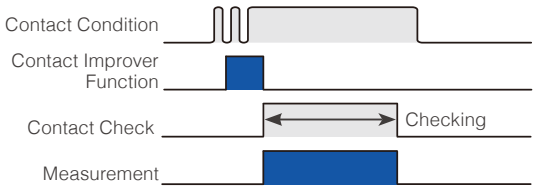
Reduce Contact Error Rate

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

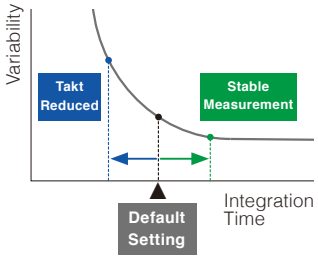


Noise Resistant

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.

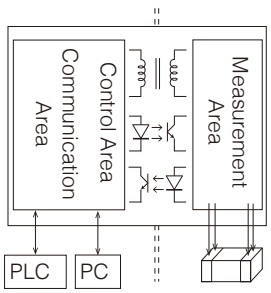


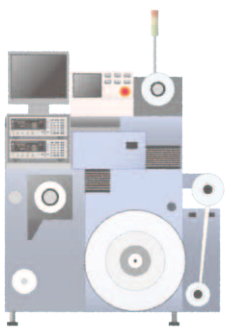
Default Setting

Range	LOW POWER: OFF		
	Integration Time		
	FAST	MED	SLOW
100 mΩ	0.5 ms	5.0 ms	1 PLC
1000 mΩ	0.3 ms	2.5 ms	1 PLC
100 kΩ	0.5 ms	3.0 ms	1 PLC
1000 kΩ	1.5 ms	5.0 ms	1 PLC

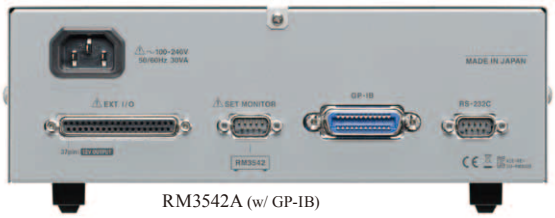
Noise-Resistant Floating Structure

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     --
```

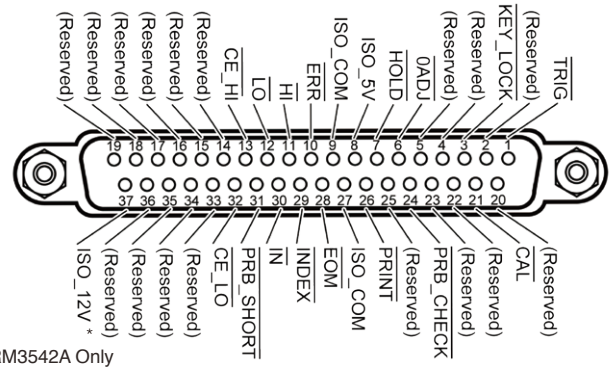
Printing Example (SAMPLE)

```
 -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

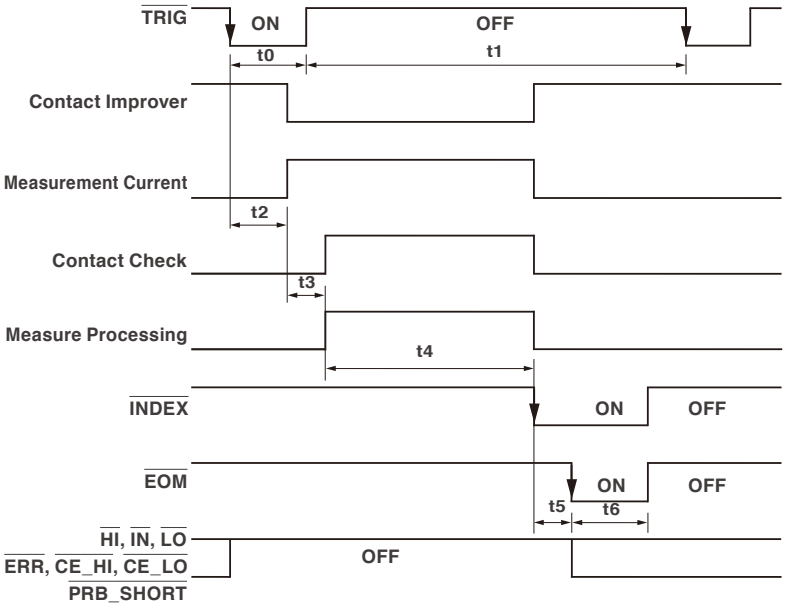
■ Connector

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

$\overline{\text{TRIG}}$	External Trigger
$\overline{\text{0ADJ}}$	Zero-Adjust
$\overline{\text{PRINT}}$	Printing
$\overline{\text{CAL}}$	Self-Calibration
$\overline{\text{HOLD}}$	Hold
$\overline{\text{PRB_CHECK}}$	Probe Short-Circuit Detection
$\overline{\text{KEY_LOCK}}$	Key Lock

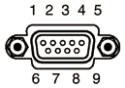
● Output Signals

$\overline{\text{ERR}}$	Measurement Fault Output
$\overline{\text{CE_HI}}$	Contact error (H_{CUR}, H_{POT} side)
$\overline{\text{CE_LO}}$	Contact error (L_{CUR}, L_{POT} side)
$\overline{\text{PRB_SHORT}}$	Probe short-circuit error
$\overline{\text{INDEX}}$	End of Import
$\overline{\text{EOM}}$	End of Measurement
$\overline{\text{HI}}$, $\overline{\text{IN}}$, $\overline{\text{LO}}$	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
Characters per line	At least 45
Communication speed	9600 bps
Data bits	8 bit
Parity	None
Stop bits	1 bit
Flow control	None

RM3542 Main unit connector



Function	Signal Name	Pin
Receive Data	R x D	2
Transmit Data	T x D	3
Signal Ground	GND	5

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 ■Reference value: Setting range 0.00 mΩ to 120.00 MΩ (LOW POWER: OFF) 0.0 mΩ to 1200.0 Ω (LOW POWER: ON) ■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 ■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 $\overline{\text{TRIG}}$ signal and F4 [MANU] button.
	Number of memory slots: 30000 (volatile memory, no backup)
	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
Auto-Memory Function	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

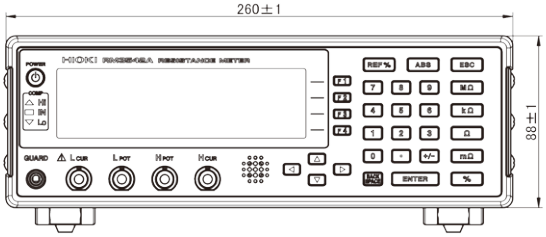
Range	Maximum Display Value*1	Resolution	Measurement Accuracy: ± (%rdg. + % f.s.)			Measurement Current*2	Open-Circuit Voltage
			FAST	MED	SLOW		
100 mΩ	120.0000 mΩ	100 nΩ	0.015 + 0.008	0.015 + 0.003	0.015 + 0.002	100 mA	20 V max *3, *4, *5
1000 mΩ	1200.000 mΩ	1 μΩ	0.012 + 0.003	0.012 + 0.002	0.012 + 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	

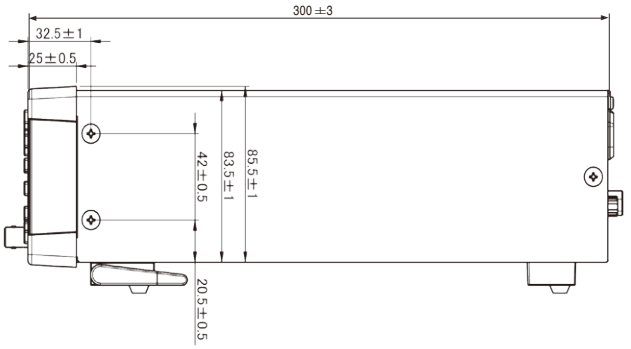
LOW POWER: ON

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	
100 Ω	120.0000 Ω	100 μΩ	0.010 + 0.003	0.008 + 0.002	0.008 + 0.001	1 mA	20 V max (RM3542) *3, *5
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	

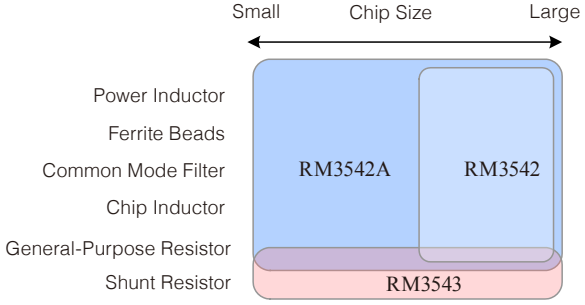
*1 Negative values can be up to 10% of positive full scale.
*2 Measurement current accuracy is ±5%.
*3 Voltage when not measuring is 20 mV or less, with current mode set at PULSE and Contact Improver Setting set at OFF/PULSE (with a voltmeter having 10 MΩ).
*4 VOLTAGE LIMIT ON: 10 V max
*5 With the sum 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

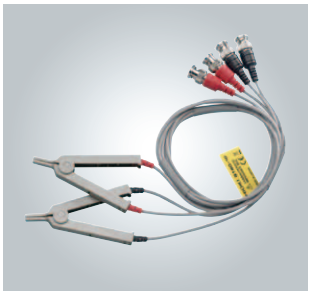
Model No. (Order Code)	GP-IB
RM3542-50	—
RM3542-51	Included

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)

GP-IB CONNECTION CABLE 9151-02



Cord length: 2 m (6.56 ft)

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

HIOKI
HIOKI E.E. CORPORATION
HEADQUARTERS
81 Koizumi,
Ueda, Nagano 386-1192 Japan
https://www.hioki.com/

Our regional contact information

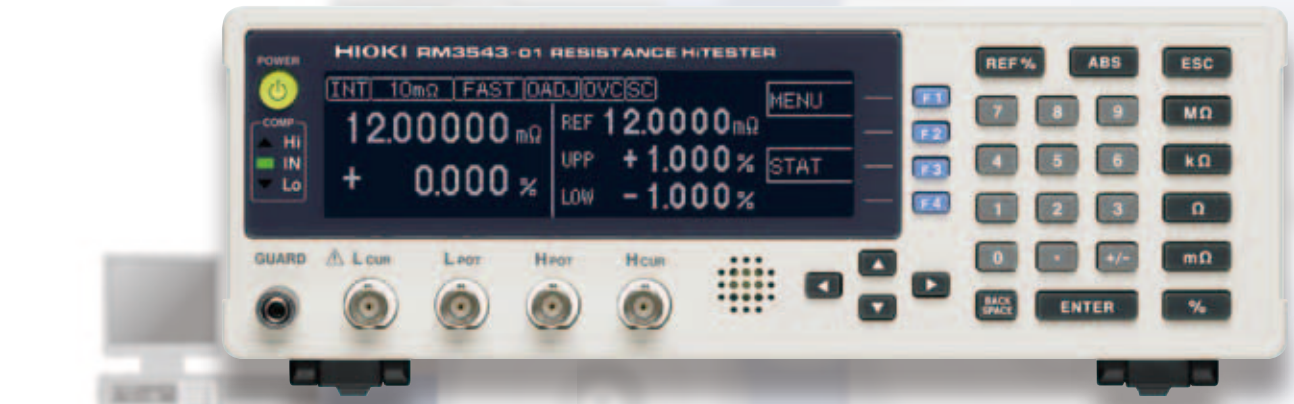
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ASM®

ASM Automation Sensorik Messtechnik GmbH
Tel. +49 8123 986-0
info@asm-sensor.de
www.asm-sensor.de
Am Bleichbach 18 - 24
85452 Moosinning

HIOKI

RESISTANCE HiTESTER RM3543





Resistance Meter for Ultra-low and Low Shunt Resistance

Measuring 0.1 mΩ with a High Accuracy of ±0.16% and High Resolution of 0.01 μΩ*

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 ±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

CE



Shunt Resistance Meters Capable of Measuring 0.1 mΩ

RESISTANCE HiTESTER RM3543, RM3543-01

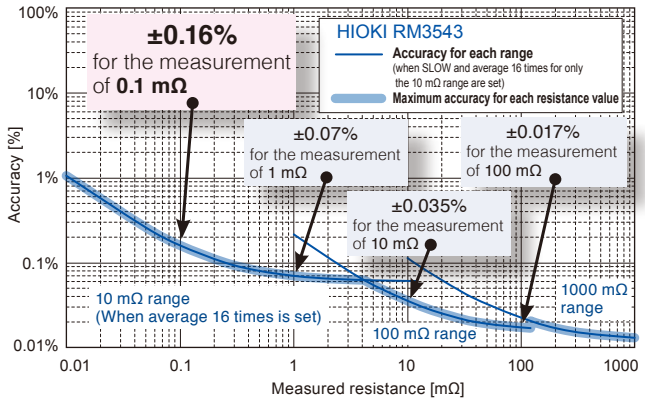
Features

- Measure 0.1 mΩ with a high accuracy of ±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 ±1% Shunts with Room to Spare

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



OVC (Offset Voltage Compensation)

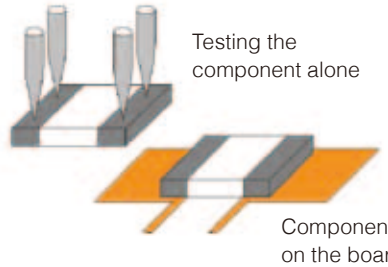
Thermal EMF occurs at the contact point of different metals. This voltage affects measurements, and if large enough, can cause measurement errors. The offset voltage compensation function minimizes the effect of thermal EMF to maintain measurement accuracy. Particularly when measuring shunt resistances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

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.



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.

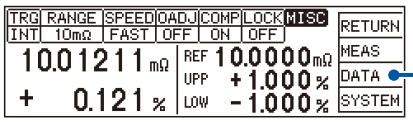


Contact Improver and Check Functions

2. Positive contact assures reliable measurements

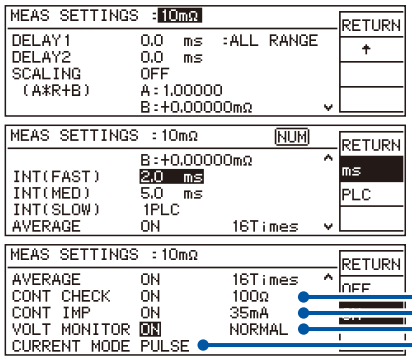
Select contact-check and make other adjustments to ensure accurate measurement and the best performance.

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

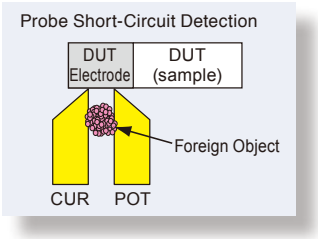
The "Contact Improver" function improves bad contacts between probes and test samples. Contacts errors are reduced by penetrating oxidation and impurities between probes and samples.
Reducing contact errors can increase productivity and quality. The intensity of the Contact Improver function can be adjusted 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.



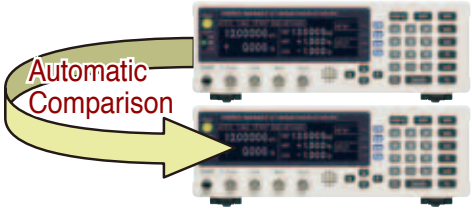
3. Speed and functions required for automated systems have been achieved

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

- After 30-minute warm-up time.
- Add ±(0.1% measurement accuracy)/°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 ±2°C.

Resistance Measurement [1-year accuracy (@23 ±5°C, 80% RH or less)]

Accuracy = ±(% 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
10mΩ (Average 16 times*3)	12.00000mΩ	10nΩ	0.060+0.005	0.060+0.003	0.060+0.001*3	1A	ON	20Vmax*4,*5
10mΩ					0.060+0.002			
100mΩ (1A)	120.0000mΩ	100nΩ	0.060+0.003	0.060+0.002	0.060+0.001	1A	ON	
100mΩ (100mA)	120.0000mΩ	100nΩ	0.015+0.008	0.015+0.003	0.015+0.002	100mA	ON	
1000mΩ	1200.000mΩ	1μΩ	0.012+0.003	0.012+0.002	0.012+0.001	100mA	ON	
10Ω	12.00000Ω	10μΩ	0.010+0.003	0.008+0.002	0.008+0.001	10mA	ON	
100Ω	120.0000Ω	100μΩ	0.009+0.003	0.007+0.002	0.007+0.001	10mA	ON	
1000Ω	1200.000Ω	1mΩ	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 ±5%.
*3. When the average ON 16 times or more is set (SLOW is specified only for the 10 mΩ 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 MΩ).
*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 mΩ (10 mΩ 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 ±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 × 88 mm (3.46 in) H × 300 mm (11.81 in) D (without projections)
Mass	Approx. 3.0 kg (105.8 oz)
Accessories	Power cord ×1, EXT I/O male connector ×1, Operation manual ×1, Operation guide ×1
Applicable Standards	Safety: EN61010 EMC: EN61326, EN61000-3-2, EN61000-3-3

Ordering information

Model : RESISTANCE HiTESTER RM3543

Model No. (Order Code)	(Note)
RM3543	
RM3543-01	(Built in 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))

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HIOKI
HIOKI E.E. CORPORATION
HEADQUARTERS
81 Koizumi, Ueda, Nagano 386-1192 Japan
TEL +81-268-28-0562 FAX +81-268-28-0568
http://www.hioki.com / E-mail: os-com@hioki.co.jp
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