HIOKI

LCR HiTESTER 3511-50

Components measuring instruments

CE

Minimum measurement time of 5 ms, built-in comparator and ±0.08% measurement accuracy

Improved for even faster and more efficient measurements !

The 3511-50 LCR HiTESTER features both high performance, highspeed measurements with a low prices. The minimum measurement time of 5 ms and basic accuracy of ±0.08% makes the instrument suitable for use on production lines and laboratories. The built-in high-speed comparator significantly reduces production line tact time and allows the construction of automatic production lines.
The very compact body features a clearly visible LED display that facilitates easy operation and allows settings to be confirmed at a glance.
With its high-speed measurement, highly accurate measurement capabilities and great cost performance, this LCR measurement instrument is bound to satisfy the needs of a variety of users.

ISO 9001 JMI-0216
ISO14001 JQA-E-90091

Better Speed, Better Accuracy

Powerful Functions for Greater Line Efficiency

■ Minimum measurement time of 5 ms

Three sampling rates can be selected: FAST, NORMAL and SLOW. The minimum measurement time of 5 ms (with 1 kHz/|Z| display) gives rapid sampling for improved production line efficiency.
(Differs with the measurement frequency and display parameters.)

■High resolution and high measurement accuracy

The measurement resolution provides a full five digits, and the basic measurement accuracy is ±0.08%.

■ RS-232C interface as standard feature

With the exception of turning the power on or off, all the basic functions can be controlled from a PC. Use of a PC enables efficient data management, processing, and setting of measurement conditions, plus a variety of other functions. A GP-IB interface can also be installed as an option.

■ RS-232C interface specifications
Transmission method: Start-stop synchronization. Transmission speed: 9600 bps. Data length: 8 bits. Parity: None. Stop bit: 1 bit. Delimiter: CR+LF. Handshake: Hardware. Connector shape: D-sub 9pin (male). Connecting cable: Reverse cable

■ EXT.I/O

Trigger signals, recording ON/OFF, and loading of measurement conditions can be externally controlled. Complete interface allows the unit to be used as an automatic instrument where comparator results, measurement-completed signals, etc., can be output to an external device.

■ Comparator function

Upper limit and lower limit values can be set for both the main parameters (any of Z or C or L or R) and sub-parameters (any of θ or D or Q). The measurement results are signaled by a buzzer and LED indication and can also be output to an external source. The output is separated into main- and sub-parameter measurement results together with AND.

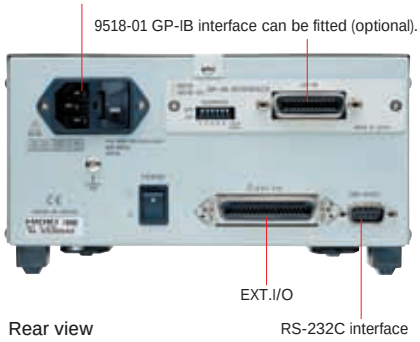
■ Memory for 99 sets of measurement conditions

Up to 99 sets of measurement conditions, including comparator values, provide rapid response to constantly changing components on flexible production lines.
These conditions can also be externally switched via the EXT.I/O.

■ Compact size

The small dimensions, 210 (W) × 100 (H) × 168 (D) mm, approximately 2.5 kg (4.00"W × 8.30"H × 6.60"D; 88 oz. approx.), make it easy to incorporate the instrument into production lines.

The AC power supply voltage is selectable :
100 V, 120 V, 220 V or 240 V AC.

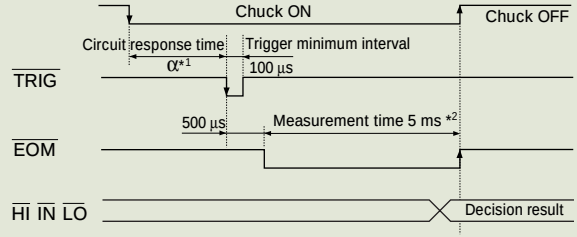


Rear view

Timing chart for EXT. I/O sequencing

The following chart shows the timing sequence of the trigger (TRIG), and end-of-measurement (EOM) signals from the EXT. I/O connector.

EXT. I/O signals	
● Outputs	● Inputs
• Internal DC power (+5 V output)	• External DC power supply (+5 V to +24 V can be supplied by external device)
• Comparator result (main-/sub-parameters together with AND output)	• External trigger signal
• Analog measurement completion	• Memory setting selection (including comparator conditions)
• End-of-measurement	



*1 α depends on the sample and trigger delay.
*2 Reference value for 1 kHz measurement frequency, FAST mode, |Z| measurement.
Measurement time differs with measurement conditions.

... and Better Size !

Basic Performance

■ Seven parameters measured

The seven parameters |Z|, R, θ, C, L, D, and Q can be measured. The main- and sub-displays can be combined in five ways: |Z|-θ, C-D, L-D, L-Q, R.

■ Easy operation by simple selections and LED display

To operate, simply select from the items displayed on the panel. Selected measurement conditions are indicated by illuminated LEDs allowing settings to be checked at a glance. Measurement results are also displayed by LED indication that makes it easy to check the values even in dark locations.

■ DC bias measurement

Using the optional 9268/9269 DC BIAS UNIT, voltage and current bias measurements are simple.
The 9268 can be used for voltages up to a maximum of DC±40 V. The 9269 can be used for currents up to a maximum of DC±2 A.

Example of connecting the 9262 and 9268 / 9269

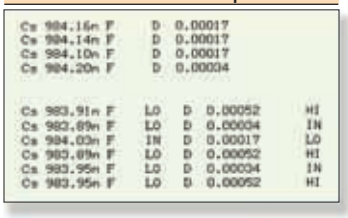
■ Measurement signals

Measurement frequency: 120 Hz/1 kHz. Signal level: 50 mV, 500 mV, 1 Vrms settable.

■ Printer output

Measurement values and comparator results can be printed out on the optional 9442 Printer by connecting this via the standard RS-232C interface. This is convenient for attaching data to inspection reports, etc.
(The optional 9444 Connection Cable and AC adapter are necessary for connecting the printer.)

Printout example



■ 9442 PRINTER specifications

●Printing method : Thermal serial dot printer●Recording width : 112 mm (4.41")●Printing speed : 52.5 cps●Power supply : 9443 AC ADAPTER or supplied Ni-MH battery pack (prints 3000 lines on full charge from 9443 AC ADAPTER)●Dimensions and mass: 160W × 66.5H × 170D mm; 580 g approx. (6.30"W × 2.62"H × 6.70"D; 20.46 oz. approx.)

Resulting measurement data can be output not only to a printer, but also other media such as a PC or sequencer. Using the RS-232C interface makes transferring the inspection data simple and convenient.

■ Specifications

Measurement parameters	|Z|, C, L, R, θ, D, Q * Five possible display combinations: |Z|-θ, C-D, L-D, L-Q, R.	
Measurement frequency (±0.01%)	120 Hz	1 kHz
Measurement time (typical values for displaying |Z|) Excluding time for open/short circuit compensation, evaluation.	FAST : 13 ms, NORMAL : 80 ms, SLOW : 400 ms	FAST : 5 ms, NORMAL : 60 ms, SLOW : 300 ms
Measurement ranges |Z|, R	10 mΩ to 200.00 MΩ	
C	9.40 pF to 999.99 mF	0.940 pF to 99.999 mF
L	14.00 μH~200.00 kH	1.600 μH~20.000 kH
θ	-90.00° to +90.00°	
D	0.0001 to 1.9900	
Q	0.85 to 999.99	
Basic accuracy	Z : ±0.08% rdg. θ ± 0.05°	
Measurement signal levels	50 mV/500 mV/1 V rms (±10% ±5 mV)	
Equivalent circuit mode	Serial- and parallel equivalent circuit mode, automatic/manual	
Output impedance	50 Ω	
Display method/Max. count	LED (5-digit display, full-scale count depends on range)	
No. of measurement condition memory retention	Max. 99 (including comparator conditions)	
Comparator comparison method	Any of the main parameters (any of |Z| or C or L or R) and sub-parameters (any of θ or D or Q) can be set to upper limit and lower limit value settings. The measurement results are signaled by LED indication and a buzzer and EXT.I/O output (main- and sub-parameter evaluation results, AND output).	
DC bias	Possible when the optional 9268 (±40 V max.) or 9269 (±2 A max.) is used.	
External printer	9442 PRINTER (option)	
External interfaces	RS-232C, (GP-IB is option), EXT.I/O for sequence use.	

Measurement range (Auto/Hold range, 5-digit display)
|Z|, R : 100 m/1/10/100/1 k/10 k/100 k/1 M/10 M/200 MΩ
C (120 Hz) : 145 p/1.45 n/14.5 n/145 n/1.45 μ/14.5 μ/145 μ/1.45 m/14.5 m/1 F
C (1 kHz) : 17 p/170 p/1.7 n/17 n/170 n/1.7 μ/17 μ/170 μ/1.7 m/100 mF
L (120 Hz) : 130 μ/1.3 m/13 m/130 m/1.3/13/130/1.3 k/13 k/200 kH
L (1 kHz) : 15.5 μ/155 μ/1.55 m/15.5 m/155 m/1.55/15.5/155/1.55 k/20 kH
Dimensions, mass : 210H × 100W × 168D mm, 2.5 kg approx. (8.30"H × 4.00"W × 6.60"D ; 88 oz. approx.)
Power supply : 100 V/120 V/220 V/ 240 V AC ± 10% (selectable), 50/60 Hz
Max. rated power : 20 VA max.
Supplied accessories : Power cord, spare fuse for power supply (in accordance with the ordered power specifications, either 100/120 VAC 1 A, 220/240 VAC 0.5 A)
Conformity : EMC EN61326-1:1997+A1:1998
EN61000-3-2:1995+A1:1998+A2:1998
EN61000-3-3:1995
Safety EN61010-1:1993+A2:1995
Power supply; Pollution degree 2 Overvoltage Category Ⅱ (anticipated transient overvoltage 2500 V)
Test terminals; Pollution degree 2 Overvoltage Category I (anticipated transient overvoltage 330 V)

Measurement accuracy and range

Conditions of guaranteed accuracy :

Temperature and humidity 23°C±5°C (73°F±9°F), less than 80% RH (no condensation), following 60 min. warm-up after power is turned ON, after open/shut calibration, use of 9261 Test Fixture, measurement signal level 1 Vrms, measurement speed set to SLOW.
The various accuracy specifications presume that θ< ±6°C for R, D≦0.1 for C-D, D≦0.1 for L-D, Q≧10 for L-Q.
Q accuracy is defined by the calculation of 1/D.
Measurement range and accuracy differ with the used Test Fixture, measurement signal level and measurement speed.

	Frequency (|Z|-θ and R have common frequency)	Range									
		100 mΩ	1 Ω	10 Ω	100 Ω	1 kΩ	10 kΩ	100 kΩ	1 MΩ	10 MΩ	200 MΩ
|Z|-θ	|Z|	± (1.00+0.15/Z_L)%	±1.80%	±0.35%	±0.08%	±0.08%	±0.11%	±0.14%	±0.30%	±(0.15+0.16×Z_H)%	±(2.00+0.11×Z_H)%
	θ	±(0.10+0.09/Z_L)°	±1.00°	±0.18°	±0.08°	±0.05°	±0.08°	±0.10°	±0.19°	±(0.10+0.09×Z_H)°	±(0.70+0.08×Z_H)°
R	-	±(1.00+0.21/R_L)%	±2.10%	±0.39%	±0.10%	±0.09%	±0.13%	±0.16%	±0.34%	±(0.15+0.20×R_H)%	±(2.00+0.16×R_H)%
	120 Hz	1 F	14.5 mF	1.45 mF	145 µF	14.5 µF	1.45 µF	145 nF	14.5 nF	1.45 nF	145 pF
	1 kHz	100 mF	1.7 mF	170 µF	17 µF	1.7 µF	170 nF	17 nF	1.7 nF	170 pF	20 pF
C-D	C	±(0.60+1.50×f×C_H)%	±2.10%	±0.39%	±0.10%	±0.09%	±0.13%	±0.16%	±0.34%	±{0.17+30/(f×C_L)}%	±{1.70+30/(f×C_L)}%
	D	±(0.0015+0.0108×f×C_H)	±0.0179	±0.0034	±0.0016	±0.0011	±0.0016	±0.0020	±0.0036	±{0.0020+0.264/(f×C_L)}	±{0.0120+0.25/(f×C_L)}
	120 Hz	130 µH	1.3 mH	13 mH	130 mH	1.3 H	13 H	130 H	1.3 kH	13 kH	200 kH
	1 kHz	15.5 µH	155 µH	1.55 mH	15.5 mH	155 mH	1.55 H	15.5 H	155 H	1.55 kH	20 kH
L-D	L	±{0.90+30/(f×L_L)}%	±2.10%	±0.39%	±0.10%	±0.09%	±0.13%	±0.16%	±0.34%	±(0.17+1.17×f×L_H)%	±(2.00+1.00×f×L_H)%
	D	±{0.0021+0.264/(f×L_L)}	±0.0179	±0.0034	±0.0016	±0.0011	±0.0016	±0.0020	±0.0036	±(0.0020+0.0110×f×L_H)	±(0.0120+0.0100×f×L_H)

* Z_L is the sample impedance [Ω], Z_H is the sample impedance [MΩ], R_L is the sample resistance [Ω], R_H is the sample resistance [MΩ], C_H is the sample capacitance [mF], C_L is the sample capacitance [pF], L_L is the sample inductance [µH], L_H is the sample inductance [kH], and f is the measurement frequency [kHz]. (|Z|, R, C, L : ± %rdg.)

■ Options for a wide range of applications

9140 FOUR-TERMINAL PROBE
DC to 100 kHz

9143 PINCHER PROBE
DC to 5 MHz

9261 TEST FIXTURE
DC to 5 MHz

9262 TEST FIXTURE
DC to 5 MHz

9263 SMD TEST FIXTURE
DC to 5 MHz

9268 DC BIAS VOLTAGE UNIT
Maximum applied voltage: ± 40 V DC

9269 DC BIAS CURRENT UNIT
Maximum applied current: ± 2 A DC

* All cable lengths are 1 m (39.37").

3511-50 LCR HiTESTER

[Standard accessories: power cord, spare power fuse (1 A for 100/120 V AC rating, 0.5 A for 220/240 VAC rating)]

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

■ Options

9140 FOUR-TERMINAL PROBE
9143 PINCHER PROBE
9261 TEST FIXTURE
9262 TEST FIXTURE (direct connection type)
9263 SMD TEST FIXTURE (direct connection type)
9268 DC BIAS VOLTAGE UNIT
9269 DC BIAS CURRENT UNIT
9165 CONNECTION CORD (for 9268/9269; BNC to BNC; 1.5 m/59.05")
9166 CONNECTION CORD (for 9268/9269; BNC to clips; 1.5 m/59.05")
9518-01 GP-IB INTERFACE
9151-02 GP-IB CONNECTION CABLE (2 m/78.74")
9151-04 GP-IB CONNECTION CABLE (4 m/157.48")
9442 PRINTER
9443-01 AC ADAPTER (for 9442, Japan)
9443-02 AC ADAPTER (for 9442, EU)
9443-03 AC ADAPTER (for 9442, USA)
9444 CONNECTION CABLE (for 9442 / 1.5 m/59.05")
1196 RECORDING PAPER (for 9442 / 25 m/984.25", 10 rolls)

9443-02 9443-01