

Ponti LCR



	IM3536	IM3533/01	IM3533	IM3523
Settori di utilizzo	Analisi e controlli "general purpose", laboratori di prova ed assistenza	Ricerca & Sviluppo, Linea di Produzione, Controllo Qualità		Linee di Produzione ed Integrazione su macchine automatiche
Applicazione tipica	Misure di LCR generiche da DC a 8MHz	Caratterizzazione componenti elettrici ed elettronici, con funzione di scansione in frequenza	Caratterizzazione componenti elettrici ed elettronici	Misura di C-D e ESR su condensatori elettrolitici e L-Q e DCR su induttanze
Oggetto in prova (tipico)	Condensatori e induttanze in generale	Trasformatori, induttori, avvolgimenti, condensatori elettrolitici in alluminio	Trasformatori, induttori, avvolgimenti, componenti elettronici in generale	Condensatori ed induttanze in generale
Campo di Frequenza	4Hz ~ 8MHz	1mHz ~ 200kHz		40Hz ~ 200kHz
Misura di resistenza in DC	SI	SI	SI	SI
Velocità di risposta (base)	1msec	2msec		
Precisione (base)	±0.05%	±0.05%		
Compensazione in temperatura	-	SI	SI	NO
Scansione in frequenza	SI (tramite software)	SI	NO	NO
Classificazione a fine prova (BIN)	SI	SI	SI	SI
Display touch-screen	SI	SI	SI	NO
Misura simultanea	4 parametri	4 parametri		2 parametri
Misura a 4 terminali	•	•	•	•
Z (impedenza [Ω])	10 portate da 100mΩ a 100MΩ	10 portate da 100mΩ a 100MΩ		
Y (ammettenza [S])	•	•	•	•
θ (angolo di fase [°])	•	•	•	•
Rs (resistenza serie = ESR [Ω])	•	•	•	•
Rp (resistenza parallelo [Ω])	•	•	•	•
Rdc (resistenza in DC, freq. zero)	•	•	•	•
X (reattanza [Ω])	•	•	•	•
G (conduttanza [S])	•	•	•	•
B (susceptanza [S])	•	•	•	•
Ls (induttanza serie [H])	•	•	•	•
Lp (induttanza parallelo [H])	•	•	•	•
Cs (capacità serie [F])	•	•	•	•
Cp (capacità parallelo [F])	•	•	•	•
Q (fattore di merito (Q=1/D))	•	•	•	•
D (fattore di perdita [tanδ])	•	•	•	•
N (rapporto spire)	-	•	•	-
M (mutua induttanza)	-	•	•	-
ΔL (induttanza differenziale)	-	•	•	-
ε (costante dielettrica)	-	-	-	-
σ (conduttività)	•	-	-	-
T (temperatura)	-	•	•	-
Memoria per le condizioni di prova	su USB key esterna		su USB key esterna	
Memoria per i dati misurati	32000 valori su memoria interna		32000 valori su memoria interna	
Funzione Comparatore	Hi / IN / Lo (abs, % e Δ%)		Hi / IN / Lo (abs, % e Δ%)	
Check in prova del buon contatto	•	•	•	•
Tensione di misura	da 10 mV a 5V (passi da 1mV)		da 5mV a 5V (passi da 1mV)	
Misura a tensione costante (CV)	•	•	•	•
Corrente di misura	da 10uA a 50mA (passi da 10uA)		da 10uA a 50mA (passi da 10uA)	
Misura a corrente costante (CC)	•	•	•	•
Interfaccia EXT I/O	•	•	•	•
Interfaccia USB per computer	•	•	•	•
Driver per USB key	•	•	•	-
Interfaccia LAN	•	opzionale	opzionale	opzionale
Interfaccia GP-IB	•	opzionale	opzionale	opzionale
Software per computer	•	•	•	•
Alimentazione	da rete	da rete	da rete	da rete



IM3570	IM3590	IM7580	3511/50	AS250
Ricerca & Sviluppo, Linea di Produzione, Controllo Qualità	Ricerca & Sviluppo	Ricerca & Sviluppo	Analisi e controlli "general purpose", laboratori di prova ed assistenza	Laboratori assistenza e riparazione
Misura di risonanza, con funzione di scansione in frequenza	Misura su componenti elettrochimici. Rappresentazione Cole-Cole di batterie e celle a combustibile	Misure in altissima frequenza fino a 300MHz	Misure di LCR a frequenze fisso 120Hz e 1kHz	Misure LCR per indagini sporadiche e veloci
Dispositivi piezoelettrici, condensatori a polimeri, induttanze di potenza	Batterie, celle a combustibile, elettrodi, elettroliti	Condensatori e induttanze in generale	Condensatori e induttanze in generale	Condensatori induttanze e resistenze per applicazioni elettrotecniche
4Hz ~ 5MHz	1mHz ~ 200kHz	1MHz ~ 300MHz	120Hz & 1kHz	100/120Hz, 1/10/100kHz
SI	SI	NO	NO	ord
0.5msec	2msec	0.5msec	5msec	6msec
±0.05%	±0.08%	±0.72%	±0.08%	±2%
NO	SI	-	NO	NO
SI	SI	SI	NO	NO
SI	SI	SI	NO	NO
SI	SI	SI	NO	NO
4 parametri	4 parametri	4 parametri	2 parametri	2 parametri
•	•	-	•	-
12 portate da 100mΩ a 100MΩ	10 portate da 100mΩ a 100MΩ	da 100mΩ a 5kΩ	10 portate da 100mΩ a 100MΩ	-
•	•	•	•	-
•	•	•	•	8 portate da 200mΩ a 200mΩ
•	•	•	•	•
•	•	•	-	•
•	•	-	-	-
•	•	•	-	-
•	•	•	-	-
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•
-	-	-	-	-
-	-	-	-	-
-	•	-	-	-
-	•	-	-	-
-	•	-	-	-
su USB key esterna	su USB key esterna	30 set	99 set	-
32000 valori su memoria interna	32000 valori su memoria interna	32000 valori su memoria interna	-	-
Hi / IN / Lo (abs, % e Δ%)	Hi / IN / Lo (abs, % e Δ%)	Hi / IN / Lo (abs, % e Δ%)	Hi / IN / Lo	Δ%
•	-	•	-	-
da 5mV a 5V (passi da 1mV)	da 5mV a 5V (passi da 1mV)	da 4mV a 1V	50mV - 500mV - 1V	•
•	•	-	-	-
da 10uA a 50mA (passi da 10uA)	da 10uA a 50mA (passi da 10uA)	da 0,09mA a 20mA	-	-
•	•	-	-	-
•	•	•	•	-
•	•	•	-	•
•	•	•	-	-
•	•	opzionale	opzionale	-
•	•	•	•	opzionale
da rete	da rete	da rete	da rete	1 batteria 9V

3511/50

LCR robusto e basilare, 2 frequenze fisse 120Hz - 1kHz
LCR sturdy and compact, 2 fixed frequencies 120Hz - 1kHz



3511/50 offre prestazioni di tutto rispetto, misurazioni ad alta velocità con tempo minimo di misura di 5msec e precisione di base $\pm 0,08\%$.

È idoneo per l'utilizzo in linea di controllo, in laboratorio nonché inserito in macchine automatiche di produzione e test.

Compatto, molto robusto, interfaccia a LED semplice ed efficace.

EXT I/O ed RS232 in dotazione, GP-IB opzionale.

3511/50 offers respectable performance, high speed measurements with minimal time measurement 5msec and basic accuracy $\pm 0.08\%$.

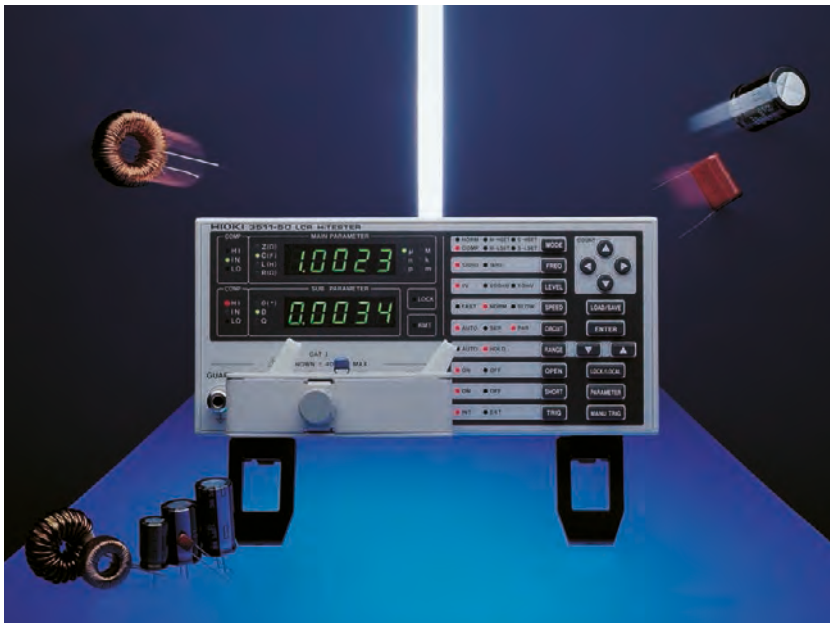
Typically used on quality control lines, in laboratory or installed in automatic machines for production and test.

Compact, very robust, LED display simple and practical.

EXT I/O and RS232 included, optional GP-IB.



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/IZI 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 $\pm 0.08\%$.

■ 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.

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	
<ul style="list-style-type: none"> ● Outputs • Internal DC power (+5 V output) • Comparator result (main-/sub-parameters together with AND output) • Analog measurement completion • End-of-measurement 	<ul style="list-style-type: none"> ● Inputs • External DC power supply (+5 V to +24 V can be supplied by external device) • External trigger signal • Memory setting selection (including comparator conditions)

■ 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

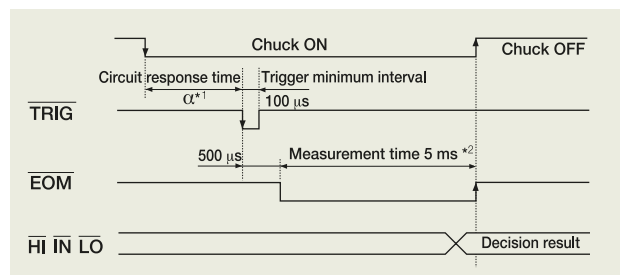
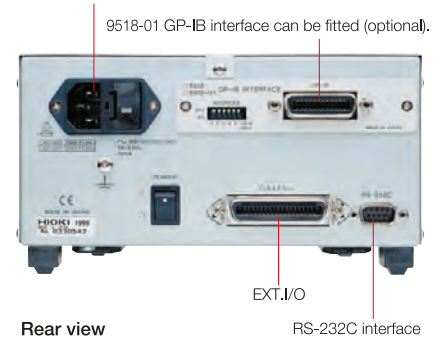
Up to 99 sets of measurement conditions, including comparator values, provide rapid response to constantly changing components on flexible production lines.

These conditions can also be externally switched via the EXT.I/O.

■ Compact size

The small dimensions, 210 (W) \times 100 (H) \times 168 (D) mm, approximately 2.5 kg (4.00"W \times 8.30"H \times 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.



*1 α depends on the sample and trigger delay.
 *2 Reference value for 1 kHz measurement frequency, FAST mode, IZI 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 \pm 40 V. The 9269 can be used for currents up to a maximum of DC \pm 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					
Cs	984.15n	F	D	0.00017	
Cs	984.14n	F	D	0.00017	
Cs	984.10n	F	D	0.00017	
Cs	984.20n	F	D	0.00034	
Cs	983.91n	F	LO	D	0.00052 HI
Cs	983.85n	F	LO	D	0.00034 IN
Cs	984.03n	F	HI	D	0.00017 LO
Cs	983.85n	F	LO	D	0.00052 HI
Cs	983.95n	F	LO	D	0.00034 IN
Cs	983.95n	F	LO	D	0.00052 HI

■ 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 x 66.5H x 170D mm; 580 g approx. (6.30"W x 2.62"H x 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 (\pm 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	10 m Ω to 200.00 M Ω	
Z , R		
C	9.40 pF to 999.99 mF	0.940 pF to 99.999 mF
L	14.00 μ H ~ 200.00 kH	1.600 μ H ~ 20.000 kH
θ	-90.00° to +90.00°	
D	0.0001 to 1.9900	
Q	0.85 to 999.99	
Basic accuracy	Z : \pm 0.08% rdg. θ \pm 0.05°	
Measurement signal levels	50 mV/500 mV/1 V rms (\pm 10% \pm 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 (\pm 40 V max.) or 9269 (\pm 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 M Ω
 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 x 100W x 168D mm, 2.5 kg approx. (8.30"H x 4.00"W x 6.60"D ; 88 oz. approx.)
 Power supply : 100 V/120 V/220 V/ 240 V AC \pm 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 V_{rms}, measurement speed set to SLOW.

The various accuracy specifications presume that $\theta < \pm 6^\circ\text{C}$ for R, $D \leq 0.1$ for C-D, $D \leq 0.1$ for L-D, $Q \geq 10$ 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 m Ω	1 Ω	10 Ω	100 Ω	1 k Ω	10 k Ω	100 k Ω	1 M Ω	10 M Ω	200 M Ω
Z - θ	Z	$\pm(1.00+0.15/Z_L)\%$	$\pm 1.80\%$	$\pm 0.35\%$	$\pm 0.08\%$	$\pm 0.08\%$	$\pm 0.11\%$	$\pm 0.14\%$	$\pm 0.30\%$	$\pm(0.15+0.16 \times Z_H)\%$	$\pm(2.00+0.11 \times Z_H)\%$
	θ	$\pm(0.10+0.09/Z_L)^\circ$	$\pm 1.00^\circ$	$\pm 0.18^\circ$	$\pm 0.08^\circ$	$\pm 0.05^\circ$	$\pm 0.08^\circ$	$\pm 0.10^\circ$	$\pm 0.19^\circ$	$\pm(0.10+0.09 \times Z_H)^\circ$	$\pm(0.70+0.08 \times Z_H)^\circ$
R	-	$\pm(1.00+0.21/R_L)\%$	$\pm 2.10\%$	$\pm 0.39\%$	$\pm 0.10\%$	$\pm 0.09\%$	$\pm 0.13\%$	$\pm 0.16\%$	$\pm 0.34\%$	$\pm(0.15+0.20 \times R_H)\%$	$\pm(2.00+0.16 \times R_H)\%$
	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	$\pm(0.60+1.50 \times f \times C_H)\%$	$\pm 2.10\%$	$\pm 0.39\%$	$\pm 0.10\%$	$\pm 0.09\%$	$\pm 0.13\%$	$\pm 0.16\%$	$\pm 0.34\%$	$\pm(0.17+30 \times f \times C_L)\%$	$\pm(1.70+30 \times f \times C_L)\%$
	D	$\pm(0.0015+0.0108 \times f \times C_H)$	± 0.0179	± 0.0034	± 0.0016	± 0.0011	± 0.0016	± 0.0020	± 0.0036	$\pm(0.0020+0.264 \times f \times C_L)$	$\pm(0.0120+0.25 \times f \times C_L)$
	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	$\pm(0.90+30 \times f \times L_L)\%$	$\pm 2.10\%$	$\pm 0.39\%$	$\pm 0.10\%$	$\pm 0.09\%$	$\pm 0.13\%$	$\pm 0.16\%$	$\pm 0.34\%$	$\pm(0.17+1.17 \times f \times L_H)\%$	$\pm(2.00+1.00 \times f \times L_H)\%$
	D	$\pm(0.0021+0.264 \times f \times L_L)$	± 0.0179	± 0.0034	± 0.0016	± 0.0011	± 0.0016	± 0.0020	± 0.0036	$\pm(0.0020+0.0110 \times f \times L_H)$	$\pm(0.0120+0.0100 \times f \times L_H)$

* Z_L is the sample impedance [Ω], Z_H is the sample impedance [M Ω], R_L is the sample resistance [Ω], R_H is the sample resistance [M Ω], 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 : \pm %rdg.)

Sonde e fixture accessorie per 3511/20 (opzionali)

	9140	Sonda a 4 terminali	DC \rightarrow 100kHz, 75 Ω
	9143	Sonda con terminali a pin	DC \rightarrow 5MHz, 75 Ω
	9261	Fixture di prova	DC \rightarrow 5MHz, 75 Ω
	9262	Fixture di prova	DC \rightarrow 8MHz, 50 Ω
	9263	Fixture di prova SMD	DC \rightarrow 8MHz, 50 Ω
	9268	Unità Bias di tensione	$\pm 4\text{VDC}$: 42Hz \rightarrow 5MHz
	9268/01	Unità Bias di tensione	$\pm 4\text{VDC}$: 42Hz \rightarrow 5MHz
	9269	Unità Bias di corrente	$\pm 2\text{ADC}$: 40Hz \rightarrow 100kHz
	9677	Fixture di prova SMD	DC \rightarrow 120MHz
	9699	Fixture di prova SMD	DC \rightarrow 120MHz