RF LCR METER
MODEL 11090-030

Chroma 11090-030 RF LCR Meter provides a high-frequency measurement and evaluation solution for passive components such as SMD chip inductors and RF filters. With a testing frequency of up to 300MHz, this instrument not only meets the increasing demand for nominal frequency testing of components like POL or small DC-DC converters, but also addresses quality anomalies that can only be detected at ultra-high frequencies. Additionally, it can fulfill common 100MHz impedance testing needs for components like EMI filters and ferrite beads.

This solution covers measurement parameters such as Z, θz, Y, θy, R, X, G, B, Ls, Lp, Cs, Cp, Rs, Rp, D, Q and other primary and secondary parameters required for testing various passive components. The wide test frequency range of 100kHz to 300MHz, using RF current-voltage conversion technology, provides a broader impedance measurement range than network analyzers and a higher frequency measurement range than auto-balancing bridge technology. This makes it suitable for analyzing passive component characteristics at different frequencies by R&D and quality assurance units. Furthermore, the instrument's ultra-low noise, low harmonic distortion signal generator delivers a high-quality measurement signal, enhancing the accuracy of impedance testing.

The 11090-030 has a basic measurement accuracy of 0.8%, ensuring highly stable and reliable measurement results. The rapid 0.5ms measurement speed significantly increases production efficiency when employed in an automated environment. The SMD test fixture is compatible with various kinds of small-sized SMDs and adopts an improved push-down actuation method, which can rotate 90 degrees and requires only three steps to change the DUT (actual testing takes about 40 seconds). This accelerates the speed of test by reducing time spent on changing differently sized DUTs and eliminating the need for repeated reassembly of device guides, which also reduces wear and maintenance costs.

Through its comprehensive design and powerful functional enhancements, Chroma 11090-030 offers a complete test solution for product characterization, rapid testing in automated production lines, and various incoming and outgoing inspection applications.

HANDLER RS-232C USB GPIB LAN CE RoHS2 Compliant

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MODEL 11090-030

KEY SPECIFICATION

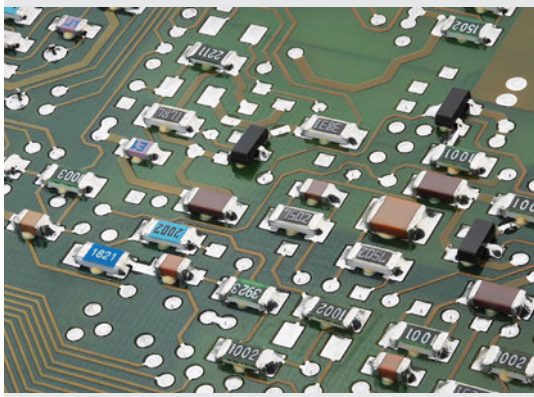
- Measurement parameters: Z, θz, Y, θy, R, X, G, B, Ls, Lp, Cs, Cp, Rs, Rp, D, Q
- Test frequencies: 100kHz~300MHz
- Measurement range: 100mΩ~5kΩ
- Measurement speed: 0.5/0.9/2.1/3.7 (ms)
- Basic accuracy: ± 0.8% % (typical ± 0.45%)
- Test signal: -40~1(dBm)
- Measurement modes: Point/List
- Test signal (Vm, Im) monitoring function
- Comparator and sorting (13 bins) functions
- Contact Check (Rdc 0.1Ω~100Ω @ 1mA max)
- Open/short circuit correction and load compensation functions
- Standard interfaces: Handler, RS-232C, GPIB, LAN, USB, USB (USBTMC)

KEY FEATURES

- Wide range of test frequencies: 100kHz~300MHz
- Fast measurement speed: 0.5 (ms)
- Various functions:
  - Calibration/compensation status guidance
  - Contact check for magnetic components through Rdc
  - Multi-parameter comparison and bin-sorting
  - Multi-point (~401 points) test and curve drawing
  - Clear and guided operation
- Fast-operating SMD test fixture (patent TW M621845 / CN 216013502U)

APPLICATIONS

- SMD inductors (molded inductors/multilayer inductors/beads, etc.)
- EMI-filter
- Other passive components



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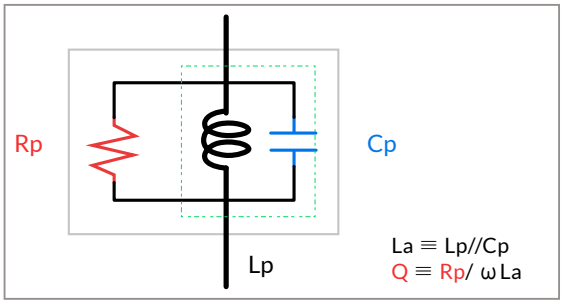
UP TO 300MHZ TESTING FREQUENCY

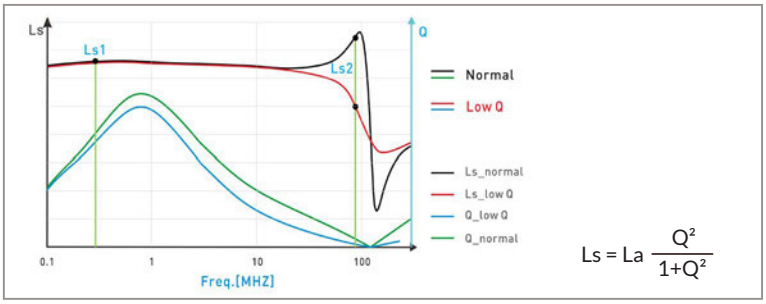
High-frequency small power inductors are mostly of the metal molded type. However, anomalies such as ① poor original magnetic material (large metal powder/faulty iron oxide film), ② partial oxide film damage after impulse winding test, or ③ coil enamel insulation damage leading to direct contact with the magnetic material, can all cause a reduction in quality factor (Q), making them susceptible to overheating during subsequent use. When testing for these three types of anomalies under nominal frequency test conditions, the Q-value is significantly influenced by the probe’s contact resistance due to the low impedance of the inductor. By increasing the testing frequency to raise impedance and reduce the impact of the probe’s contact resistance, the detection rate of abnormalities in the magnetic material and wire insulation can be enhanced. This method is widely adopted in the inductor industry.

Most magnetic metal powders used for inductors have their surfaces treated with an oxide film to reduce eddy current losses caused by high-frequency AC, in turn expanding the usable frequency range while reducing power losses and heat. Although users cannot determine powder size and the integrity of the oxide film compression molding and sintering from their outside appearance, high-frequency testing is effective in discerning these characteristics.

Figure 1 shows a high-frequency equivalent circuit for an inductor and the formula for the relationship between inductance (Ls) and Q. It is common industry practice to use an Ls value near the self-resonant frequency (SRF) to detect the quality anomalies described earlier. This is essentially a check of whether the Q-value is low while avoiding the impact of contact resistance. Normal inductors have higher Ls close to their SRF because of stray capacitance, while defective products exhibit lower Ls due to significantly reduced Q-values resulting from excessive loss. Chroma 11090-030's wide 100kHz-300MHz testing range meets the dual testing requirements of rated Ls/Q and high-frequency Ls, satisfying the production needs of such inductors. The tester is also suitable for R&D, quality assurance, and general inductor use cases.



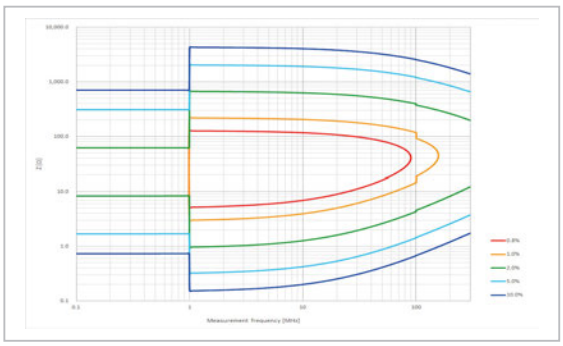
(Figure 1) High-frequency equivalent circuit for inductor and the Ls-Q formula



(Figure 2) Sample measurements and explanatory curves

IMPEDANCE MEASUREMENT AND ACCURACY

Chroma 11090-030 uses the RF-IV measurement method to measure the voltage and current of the device under test (DUT). Compared with conventional network analyzers, the 11090-030 provides more accurate measurements over a wider impedance range (100mΩ~5kΩ), and is capable of measuring inductance values as small as a few nH. In addition, the 11090-030’s wide frequency range (100kHz to 300MHz) caters to DUTs with dual-frequency test requirements that involve hundreds of kHz as well as MHz levels, eliminating the need to deploy separate test equipment in multiple sets or stations and thereby reducing procurement costs.



Measurement time Slow, test signal 1dBm, average number of times ≧ 8, at 23℃.

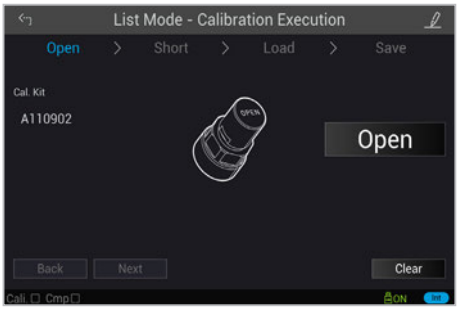
Example of meas. accuracy Zx = 50 Ω (at 100 MHz)	± 0.8 %
Example of meas. accuracy Zx = 6.28 Ω (10 nH) *Note2	± 1.58 %
Impedance measurement range (meas. accuracy ≤ ± 10%) *Note3	0.16 Ω ~ 4.3 kΩ

Note1. Avg = 8, OSC = 1 dBm, calibration is performed (at 23 ± 5 ° C)
Note2. Freq = 100 MHz, Ave = 8, OSC = 1 dBm, calibration is performed (at 23 ± 5 ° C)
Note3. Freq = 1 MHz, Ave = 8, OSC = 1 dBm, calibration is performed (at 23 ± 5 ° C)

CALIBRATION/COMPENSATION GUIDANCE FUNCTION

Accurate calibration (OPEN/SHORT/LOAD) is crucial in RF LCR measurements. Any errors or omissions in the calibration process can lead to inaccurate results. The 11090-030 features a guided calibration/compensation method that eliminates errors in this complex process. The user-friendly guided calibration procedure reduces the risk of missing steps, provides graphical guidance to minimize errors in selecting standard components, and offers corresponding displays for users who have completed the calibration process.

Calibration/compensation menu

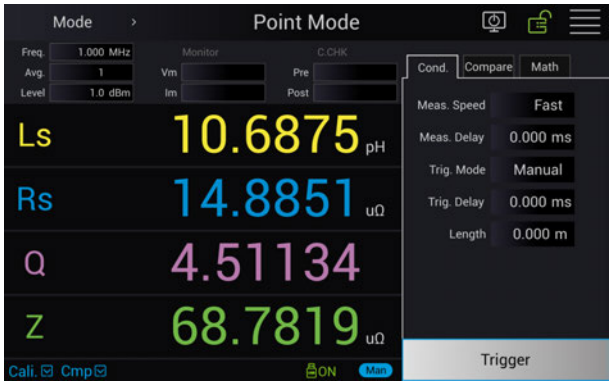


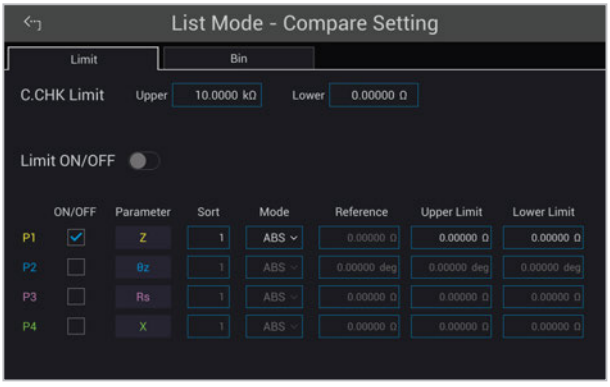
Calibration menu

Compensation menu

CONTACT CHECK FOR MAGNETIC COMPONENTS USING Rdc

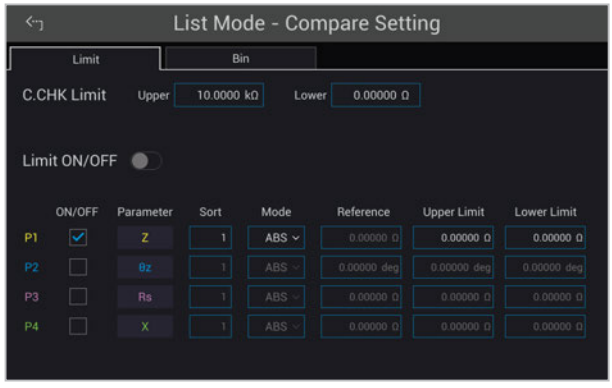
SMD components subjected to RF LCR measurements are generally very small, and determining the quality of contact with test fixtures or in automated tests is challenging. The 11090-030 provides a contact check function for magnetic components using direct current resistance Rdc. Since Rdc is a parameter that doesn't require calibration and offers the most direct way to confirm contact for magnetic components (inductors, EMI filters, beads), this function helps to achieve more accurate sorting of defects on the production line and enhances the efficiency of classifying faulty products.





MULTI-PARAMETER COMPARISON AND CLASSIFICATION FUNCTION

RF testing involves determining the quality of goods or defects in different frequency domains, which might vary due to different parameters, absolute values, percentages, main and secondary parameter focus, and high/low judgment methods. The Chroma 11090-030 offers a highly flexible table format with up to 13 bins, each having four limit values. Conditions like frequency and measurement parameters can be independently set for each column, enabling the 11090-030 to meet diverse sorting requirements, including different parameters under different measurement frequencies.



MULTI-POINT TESTING AND CURVE DRAWING WITH UP TO 401 POINTS

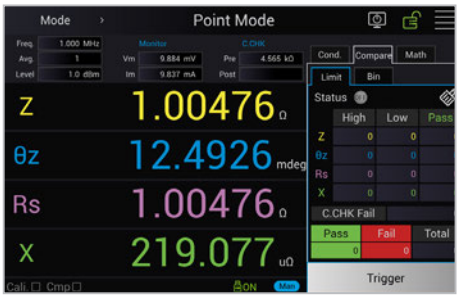
RF components often require analyzing parameter frequency response changes across multiple frequency domains. The 11090-030's multi-point measurement function allows setting up to 401 points, providing users with detailed and precise measurement values. It offers the choice of multi-point lists and characteristic curve plotting, which helps production test and analysis personnel to gain a rapid understanding of component frequency characteristics.

Multi-point list

Simultaneous multi-parameter curve plotting

Single-parameter curve plotting

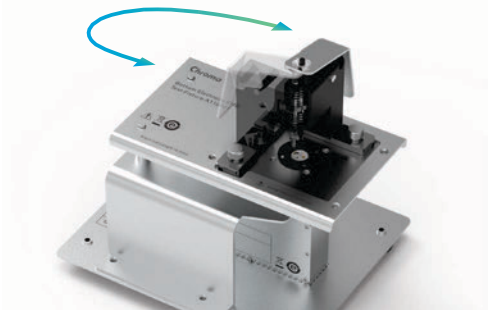
CLEAR AND GUIDED OPERATION



Utilizing a touch-enabled, full-color, high-resolution LCD display, the 11090-030 clearly shows multiple parameter test results and settings, comparison and sorting results, and deviations from reference values. Easily identifiable icons indicate instrument status and provide guidance for quick operations, providing users with usability as well as comprehensive information.

FAST-OPERATING SMD TEST FIXTURE (PATENT TW M621845 / CN 216013502U)

SMD components come in diverse and minuscule sizes, requiring extremely precise special materials for positioning. However, changing sizes often requires reassembling the device guides, which is not only time-consuming but also risks damaging expensive components and shims. The SMD test fixture is compatible with various kinds of small-sized SMDs and adopts an improved push-down actuation method, which can rotate 90 degrees and requires only three steps to change the DUT (actual testing takes about 40 seconds). This accelerates the speed of test by reducing time spent on changing differently sized DUTs and eliminating the need for repeated reassembly of s device guides, which also reduces wear and subsequent maintenance costs.

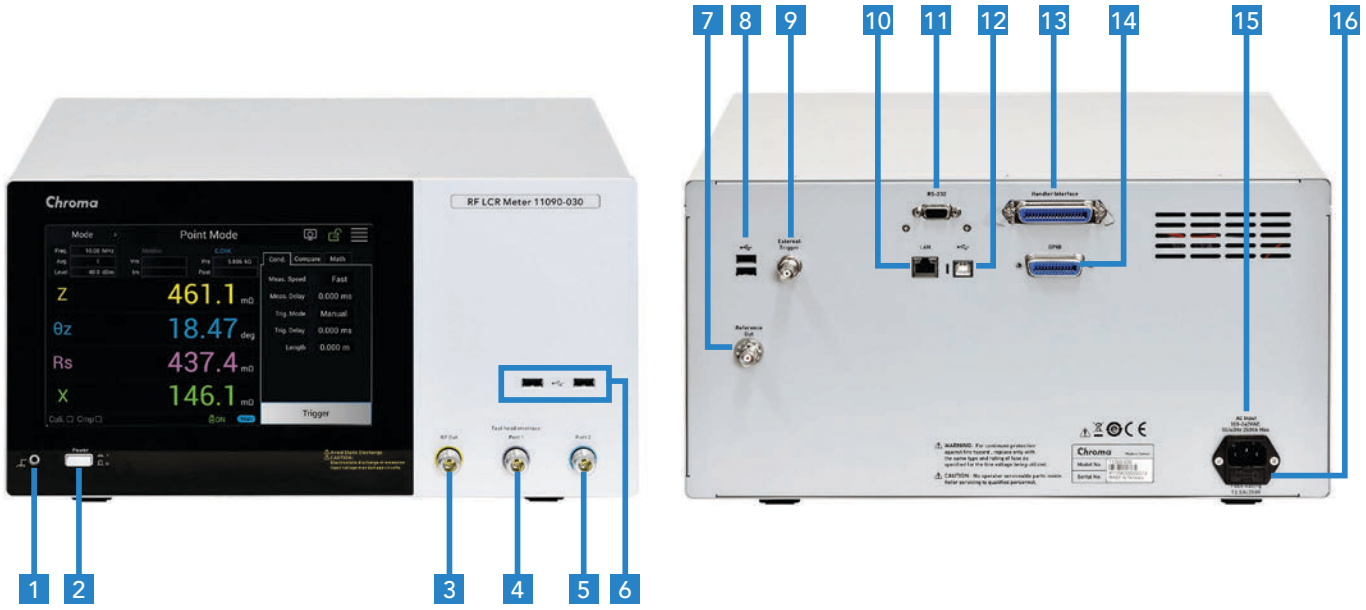


A110901 SMD test fixture	
Frequency range	DC to 3GHz
Operating temperature range	-55°C ~ +85°C
Accommodated SMD sizes	3225 (mm)/1210 (inch) 3216 (mm)/1206 (inch) 2012 (mm)/0805 (inch) 1608 (mm)/0603 (inch) 1005 (mm)/0402 (inch)

TRANSMISSION INTERFACE

The 11090-030 offers a complete range of interfaces, which includes interfaces for setting measurement conditions, triggering measurement actions, determining measurement results and collecting measurement data. LAN, GPIB, USB (B-Type), RS-232 and USB (A-Type) storage interface are all included. Through the Handler interface, measurements can be triggered and the judgment results can be exported.

PANEL DESCRIPTION



1. Grounding Terminal
2. Power Switch
3. RF Out
4. Port 1
5. Port 2
6. USB-Host Port (A-Type)
7. Reference Out
8. USB-Host Port (A-Type)
9. External Trigger (In)
10. LAN Port
11. RS-232 Port
12. USB Port (B-Type)
13. Handler Interface
14. GPIB Interface
15. AC Power Input Socket (AC Line)
16. Fuse

Note*1: The USB port cannot be used for powerbank charging, cell phone charging or devices with current requirements over 0.5A.

SPECIFICATIONS

Model		11090-030
Basic Measurement		
Measurement parameters		Z, θz, Y, θy, R, X, G, B, Ls, Lp, Cs, Cp, Rs, Rp, D, Q
Measurement range		100mΩ~5kΩ
Source		
Frequency		
Range		100kHz~300MHz
Resolution	100.0kHz ~999.9kHz	0.1kHz
	1.000MHz ~9.999MHz	0.001MHz(1kHz)
	10.00MHz ~99.99MHz	0.01MHz(10kHz)
	100.0MHz ~300.0MHz	0.1MHz(100kHz)
Uncertainty		±10ppm (23℃±5℃), ±20ppm (0℃~40℃)
Oscillator level (1M cable length)		
Power range (50Ω load)		0.0894mArms ~ 10mArms
Current range (short)		Defined by LC and Vmea measurement accuracy
Voltage range (open)		4.47mVrms~502mVrms
Uncertainty (50Ω load)		±2dB (23℃±5℃), ±4dB (0℃~40℃)
Resolution		0.1dB
Output impedance		50Ω (Nominal)
Measurement time		Very Fast (0.5ms) / Fast (0.9ms) / Medium (2.1ms) / Slow (3.7ms)
Averaging factor		1~100
Measurement accuracy		Condition for definition of accuracy (23℃± 5℃) 7mm Connector of 3.5mm：7mm adapter connected to 3.5mm terminal of test heads.

SPECIFICATIONS

Z		$\pm (Ea+Eb)$ [%]
θ		$\pm \frac{(Ea+Eb)}{100}$ [rad]
L, C, X, B		$\pm(Ea+Eb) \times \sqrt{(1+D_x^2)}$ [%]
R, G		$\pm(Ea+Eb) \times \sqrt{(1+Q_x^2)}$ [%]
△D	$\left\|D_x \times tan\left(\frac{E_a+E_b}{100}\right)\right\| < 1$	$\pm \frac{(1+D_x^2)\cdot tan\left(\frac{E_a+E_b}{100}\right)}{1 \pm D_x \times tan\left(\frac{E_a+E_b}{100}\right)}$
	Dx ≦ 0.1	$\pm \frac{(Ea+Eb)}{100}$
△Q	$\left\|Q_x \times tan\left(\frac{E_a+E_b}{100}\right)\right\| < 1$	$\pm \frac{(1+Q_x^2)\cdot tan\left(\frac{E_a+E_b}{100}\right)}{1 \pm Q_x \times tan\left(\frac{E_a+E_b}{100}\right)}$
	$\frac{10}{E_a+E_b} \geq Q_x \geq 10$	$\pm Q_x^2 \times \frac{(Ea+Eb)}{100}$

Definition of each parameter					
Dx		Measurement value of D			
Qx		Measurement value of Q			
Ea	(calibration temp. within 23±5℃)				
	Speed	Frequency	100.0k~999.9kHz	1.000M~100.0MHz	100.1M~300.0MHz
	Very Fast (Measurement time = 0.5ms)	1dBm	±1.24%	±0.59%	±0.61%
		-20dBm ~ +0.9dBm	±2.09%	±0.90%	±0.99%
		-33dBm ~ -20.1dBm	±4.95%	±2.07%	±2.55%
		-40dBm ~ -33.1dBm	±8.89%	±3.79%	±4.94%
	Fast (Measurement time = 0.9ms)	1dBm	±1.18%	±0.54%	±0.62%
		-20dBm ~ +0.9dBm	±1.87%	±0.66%	±0.74%
		-33dBm ~ -20.1dBm	±4.13%	±1.13%	±1.22%
		-40dBm ~ -33.1dBm	±7.27%	±2.08%	±2.26%
	Medium (Measurement time = 2.1ms)	1dBm	±1.15%	±0.52%	±0.59%
		-20dBm ~ +0.9dBm	±1.69%	±0.58%	±0.66%
		-33dBm ~ -20.1dBm	±3.49%	±0.81%	±0.90%
		-40dBm ~ -33.1dBm	±5.98%	±1.30%	±1.44%
	Slow (Measurement time = 3.7ms)	1dBm	±1.12%	±0.51%	±0.59%
		-20dBm ~ +0.9dBm	±1.55%	±0.55%	±0.63%
		-33dBm ~ -20.1dBm	±2.98%	±0.65%	±0.80%
		-40dBm ~ -33.1dBm	±4.95%	±1.00%	±1.20%
Eb	$\pm\left(\frac{Z_s}{Z_s}+Y_0 \times Z_x\right) \times 100$ [%] (Zx : measurement value of Z)				
Zs	± (Zsk + 0.5*F) [mΩ] (F:frequency [MHz]) , calibration temp. within 23±5℃				
Zsk	Speed	Frequency	100.0k~999.9kHz	1.000M~300.0MHz	
	Very Fast (Measurement time = 0.5ms)	1dBm	86	34	
		-20dBm ~ +0.9dBm	215	83	
		-33dBm ~ -20.1dBm	630	284	
		-40dBm ~ -33.1dBm	1190	592	
	Fast (Measurement time = 0.9ms)	1dBm	77	14 (avg.≧8), 19 (avg.<8)	
		-20dBm ~ +0.9dBm	181	20 (avg.≧8), 37 (avg.<8)	
		-33dBm ~ -20.1dBm	510	36 (avg.≧8), 110 (avg.<8)	
		-40dBm ~ -33.1dBm	956	248	
	Medium (Measurement time = 2.1ms)	1dBm	71	13 (avg.≧8), 15 (avg.<8)	
		-20dBm ~ +0.9dBm	154	16 (avg.≧8), 24 (avg.<8)	
		-33dBm ~ -20.1dBm	416	24 (avg.≧8), 64 (avg.<8)	
		-40dBm ~ -33.1dBm	770	133	
	Slow (Measurement time = 3.7ms)	1dBm	65	12 (avg.≧8), 14 (avg.<8)	
		-20dBm ~ +0.9dBm	133	15 (avg.≧8), 20 (avg.<8)	
		-33dBm ~ -20.1dBm	340	20 (avg.≧8), 50 (avg.<8)	
		-40dBm ~ -33.1dBm	622	100	
Yo	± (Yok + 0.15*F) [uS] (F:frequency [MHz]) , calibration temp. within 23±5℃				

SPECIFICATIONS

Yok	Speed	Frequency	100.0k~999.9kHz	1.000M~300.0MHz
	Very Fast (Measurement time = 0.5ms)	1dBm	135	38
		-20dBm ~ +0.9dBm	293	61
		-33dBm ~ -20.1dBm	747	154
		-40dBm ~ -33.1dBm	1374	291
	Fast (Measurement time = 0.9ms)	1dBm	132	22 (avg.≧8), 28 (avg.<8)
		-20dBm ~ +0.9dBm	257	30 (avg.≧8), 53 (avg.<8)
		-33dBm ~ -20.1dBm	618	52 (avg.≧8), 110 (avg.<8)
		-40dBm ~ -33.1dBm	1116	247
	Medium (Measurement time = 2.1ms)	1dBm	127	20 (avg.≧8), 23 (avg.<8)
		-20dBm ~ +0.9dBm	229	24 (avg.≧8), 35 (avg.<8)
		-33dBm ~ -20.1dBm	516	35 (avg.≧8), 63 (avg.<8)
		-40dBm ~ -33.1dBm	911	133
	Slow (Measurement time = 3.7ms)	1dBm	125	19 (avg.≧8), 22 (avg.<8)
		-20dBm ~ +0.9dBm	207	22 (avg.≧8), 30 (avg.<8)
		-33dBm ~ -20.1dBm	434	30 (avg.≧8), 50 (avg.<8)
		-40dBm ~ -33.1dBm	748	100

Model		11090-030
Support Function		
Calibration		Open, Short, Load
DC Resistance Measurement (Contact Check)	Range	0.1Ω ~ 100 Ω
	Test Signal Level	1mA (max.)
	Uncertainty (typ.)	$\pm\left[1+\left(\frac{0.05}{R_{dut}}+\frac{R_{dut}}{10000}\right)\times 100\right]$ [%] Rdut : DC resistance measurement value [Ω] (Averaging Factor= 128, Measurement accuracy applies when the calibration is performed at 23±5℃)
	Averaging Factor	1~6000
Test Signal Level Monitor	Uncertainty (Typ.)	$\pm\left[30+\left(10^{\frac{A}{20}}-1\right)\times 100+B\right]$ [%] A: uncertainty of oscillator level [dB] B: uncertainty of impedance measurement [%]
List Measurement Function		1 table, 401 points (max.)
Interface		GPIB, LAN, Handler, RS-232, USB-Host, USB-Device, BNC (External trigger), BNC (Internal signal output)
External Trigger Signal Input Connector	Level	LOW threshold voltage : 0.8V HIGH threshold voltage : 2.0V Input level range : 0 to +5V
	Pulse Width (typ.)	≧5μsec.
	Polarity	Positive or negative (selective)
	Connector Type	BNC (female)
Internal Reference Signal Output Connector	Frequency (typ.)	10MHz±10ppm (23℃±5℃)
	Level (typ.)	0dBm ± 3dB into 50Ω
	Input Impedance	50Ω (nominal)
	Connector Type	BNC (female)
Display		
Type/Size		10.1 inch IPS TFT Screen
Resolution		WXGA(1280*800)
Touch Sscreen		Yes
General		
Operation Environment		Temperature: 0℃~ 40℃, Humidity: 20%~80% RH, Altitude 0~2000M
Storage Environment		Temperature: -10℃~ 6℃, Humidity: 20%~90% RH
Power Consumption		300VA max.
Power Requirement		100~240Vac ; 50/60 Hz
Size (H x W x D)		235 x 425 x 277 mm
Weight		17 kg (typical)

All specifications are subject to change without notice.

ORDERING INFORMATION

Model	Product Name	Test Frequencies
11090-030	RF LCR Meter	100KHz~300MHz

Optional accessories		
Model	Product Name	Suitable sizes
A110900	Test Fixture Stand	
A110901	SMD Test Fixture	0603、1005、1608、2012、3216、3225 (mm)
A110902	Large SMD RF Test Fixture	4532、7060、 1211、 1513(mm) (2023/Q4)
B11090030-00	Short Bar (Size 0603 mm)	0603 mm
B11090030-01	Short Bar (Size 1005 mm)	1005 mm
B11090030-02	Short Bar (Size 1608 mm)	1608 mm
B11090030-03	Short Bar (Size 2012 mm)	2012 mm
B11090030-04	Short Bar (Size 3216 mm)	3216 mm
B11090030-05	Short Bar (Size 4532 mm)	4532 mm
B11090030-06	Short Bar (Size 7060 mm)	7060 mm
B11090030-07	Short Bar (Size 1211 mm)	1211 mm
B11090030-08	Short Bar (Size 1513mm)	1513 mm
B11090031-00	Device Guide (Size 0603 mm)	0603 mm
B11090031-01	Device Guide (Size 1005、1608、2012、 3225mm)	1005、1608、2012、3225 (mm)
B11090031-02	Device Guide (Size 4532、7060mm)	4532、7060 (mm)
B11090031-03	Device Guide (Size 1211、1513mm)	1211、1513 (mm)
B11090032-00	Electrode Plate (Size 0603mm)	0603 mm
B11090032-01	Electrode Plate (Size 1005、1608、2012、 3225 mm)	1005、1608、2012、3225 (mm)
B11090032-02	Electrode Plate (Size4532、7060 mm)	4532、7060 (mm)
B11090032-03	Electrode Plate (Size1211、1513 mm)	1211、1513 (mm)
B11090033-00	Test Head with 1 m Test Cable *3 (SMA+N-Type)	
B11090033-01	Test Head with 2 m Test Cable *3 (SMA+N-Type)	
B11090034-00	Calibration Kit (OPEN+ SHORT+ LOAD)	
B11090037-00	Magnifying Lens and Tweezers	
B11090037-01	SMA Torque Wrench 56N-cm	
B11090037-02	SMA to 7mm Coaxial Adapter	
B11090037-03	Working Standard Set	

A110900

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