

LCR-4080Q Operating Manual



LCR Meter

I. Overview

Model LCR-4080Q LCR Meter is primarily designed to measure capacitance, inductance, resistance, DC resistance and their associated quality factor, dissipation and phase angle using a series or parallel measurement mode. There are five measurement frequency available: 100Hz, 120Hz, 1kHz, 10kHz and 100kHz. It is also equipped with excellent features: auto smart check, 19999/1999 dual display, HiD type driver-free USB interface, PC record display, down to 1mA low power consumption, which altogether makes the meter a perfect solution for your needs.

Measurement range and Accuracy

L: 20mH ~ 2000H Best accuracy: (0.5%-5) ;
 C: 2000F ~ 20mF Best accuracy: (0.5%-5) ;
 R: 20Ω ~ 200kΩ Best accuracy: (0.3%-5) ;

Impedance/frequency	DCR	100/120Hz/1kHz	10kHz	100kHz
0.1-1	1.0%	1.0%	1.0%	1.0%
1-10	0.5%	0.5%	0.5%	0.5%
10-100k	0.3%	0.3%	0.5%	0.3%
100k-1M	0.5%	0.5%	0.5%	1%
1M-20M	1.0%	1.0%	1.0%	
20M-200M	2.0%	2.0%	5.0%	

Note: Please multiply by $\sqrt{1-D}$ if D exceeds 0.1

Formula to convert capacitance to impedance: $Z_C = 1/(2\pi fC)$

Formula to convert inductance to impedance: $Z_L = 2\pi fL$

II Safety Precautions

- 1) Do not use the meter in environments exposed to flammables, explosives, dust, strong sunshine, high radiation.
- 2) Do not open the bottom cover randomly if you are not professional personnel, please have the meter serviced by qualified personnel or your distributor if any maintenance, replacement or calibration is needed.
- 3) Do not disassemble or modify the meter randomly, which may cause permanent damage to the meter.
- 4) Cut off all the circuit power and discharge completely all capacitors before you measure in-line components.
- 5) Prohibit inputting voltage into measurement terminals, capacitors or other the components must be discharged before being measured.
- 6) There are two power supply methods available for the meter: 9V battery and USB-powered. When USB power adaptor is connected to USB port, the adaptor will supply power to the meter. If USB port is connected to PC, the meter is USB-powered and meanwhile communicates with PC for data collection.

III. Ambient Conditions

- 1) Altitude: <2000meters
- 2) Storage humidity: = 75%RH
- 3) Operating environment: 0°C ~ 40°C
- 4) Storage environment: -20°C ~ +50°C

IV. Features

- 1) Main display, 19999 count/Secondary display: 1999 count
- 2) Measurement frequency: 100Hz/120Hz/1kHz/10kHz/100kHz
- 3) Measurement voltage: 0.6Vrms
- 4) Output Impedance: 120Ω
- 5) Basic accuracy: 0.5%
- 6) LCR automatic identification/manual measurement
- 7) DC resistance(DCR) measurement
- 8) Open/short calibration
- 9) Auto power off
- 10) Relative measurement & sorting function
- 11) Communicates with PC using Mini-USB interface to acquire, analyze and collect data.

V. Impedance Explanation

The impedance is classified into DC and AC impedance based on measured signal. Multimeters generally measure DC impedance, but LCR meters can measure both two types of impedance. Model LCR-4080Q LCR meter is equipped with both DC and AC impedance measurements. Impedance parameter is a primary element used to assess electronic components and circuit system. When under DC condition, it is resistance measured between two ends of linear components, which can be defined by Ohm law. If under AC condition, the ratio of voltage to current is a complex. A impedance vector includes a real part (Resistance: R) and imaginary part (Reactance: X) during which impedance is expressed by R+jX in rectangular coordinate or by the $|Z| \angle \theta$ (amplitude) and θ (phase angle). Please see Figure 1 for details about the relationship.

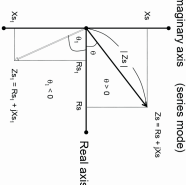


Figure 1

It is inductive reactance if $\theta > 0$, otherwise it is capacitive reactance if $\theta < 0$.

VI. Measurement Mode

Impedance can be measured in series or parallel mode. Under parallel mode, impedance Z can be expressed in relation with the admittance Y and $Y=G+jB$, G is conductance and B is Admittance.

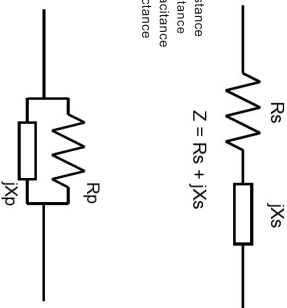
Series Measurement

- Rs: Serial mode of resistance
- Rx: Serial mode of reactance
- Cs: Serial mode of capacitance
- Ls: Serial mode of inductance

Parallel Measurement

- Rp: Parallel mode of resistance
- Xp: Parallel mode of reactance
- Cp: Parallel mode of capacitance
- Lp: Parallel mode of inductance

$$Y = 1/Z = 1/Rp + 1/Xp = G + jB$$



VII. LCD Description (See Figure 2)

- Mini LCD Items:
- 1) USB communication
 - 2) Open/short calibration
 - 3) Relative measurement
 - 4) Main display
 - 5) Secondary display
 - 6) Analog bar
 - 7) Device identifier mode
 - 8) Sorting tolerance mode
 - 9) Data hold

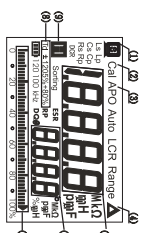


Figure 2

Other definitions:

- 1) LCR: Automatic identification mode
- 2) Lp: Parallel measurement mode for inductance
- 3) Ls: Serial measurement mode for inductance
- 4) Cp: Parallel measurement mode for capacitance
- 5) Cs: Serial measurement mode for capacitance
- 6) Rp: Parallel measurement mode for resistance
- 7) Rs: Serial measurement mode for resistance
- 8) DCR: DC resistance measurement mode
- 9) D: Dissipation factor
- 10) Q: Quality factor
- 11) θ: Phase angle
- 12) ESR: Equivalent serial resistance
- 13) EPR: Equivalent parallel resistance
- 14) DUT: Device under test
- 15) Short Press (<1second): long press (>2 seconds) indicating the time to press a button.

VIII. Meter Structure (See Figure 3)

- 1) LCD zone
- 2) Frequency/sorting button
- 3) Open/short calibration button
- 4) Power on/off button
- 5) USB communication button
- 6) DC/Ω selection button
- 7) Relative button
- 8) Input terminals
- 9) Guard terminals
- 10) Serial/parallel selection button
- 11) L/C/R Function button
- 12) Enter/Hold button
- 13) Spring Setup button

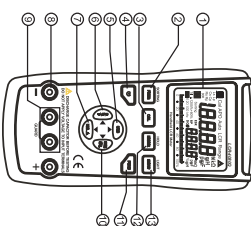


Figure 3

IX. Operation Guide

1. Automatic measurement
- The meter defaults at AUTO LCR mode and at the frequency of 1kHz after power-on. Under auto mode, the meter can automatically check the impedance characteristics of tested object and then select L, C, or R main parameter. Its associated secondary parameter and proper serial/parallel mode accordingly.

Correspondence between Main and secondary parameter under auto mode:

- Capacitance(C) — Dissipation (D):
- Inductance(L) — Quality Factor(Q):
- Resistance(R) — Phase Angle (θ).

Under auto measurement mode, serial/parallel mode is determined based on the impedance of tested object. The parallel mode is selected if the impedance is greater than 10kΩ. The serial mode is selected if the impedance is less than 10kΩ.

2. Data hold
- Press "HOLD" button to freeze the data during measurement, and " " display. Press again to exit and return to normal measurement.

3. Measurement parameter under L/C/R mode
- Phase select corresponding parameters under manual L/C/R mode.
- 1) Selection of main parameter: Default status is AUTO LCR. Her power-on. Phase select "FUNC" key to select parameters of "AUTO LCR-AUTO L-AUTO C-AUTO R-DCR-AUTO LCR".

- 2) Selection of secondary parameters: After a main parameter has been selected, press "SERIAL" button to switch between serial and parallel mode. Press "D/Ω" button to select "D", "Q", "θ", "ESR", "ESR" will show if under serial mode and "Rp" if parallel mode is selected. Under "AUTO R" or "AUTO DCR", the secondary parameter will be negligible.

Note:

- 1) When measuring capacitance—5pF under AUTO LCR mode. Rp will show on the secondary display instead of Dissipation factor(D).
- 2) Some secondary parameters will not show on LCD even you have accessed "AUTO R" or "AUTO DCR" of "AUTO LCR" mode.

4. Measurement frequency

LCR-4080Q can provide 5 frequency testing points, namely, 100Hz/120Hz/1kHz/10kHz/100kHz. Default default frequency is 1kHz and user can press "FREQ" key to select from "1kHz→10kHz→100kHz→100kHz→120Hz→1kHz".

Note: DC impedance is measured under "AUTO DCR" mode and measurement frequency can be neglected.

5. REL% measurement

REL% mode is to measure % deviation between two components. The measured value of tested object shows on the main display, and % value on the secondary display. Set the main display value as the nominal reference.

% display range: -99.9%~99.9%
 % calculation: $REL\% = (DUT - Ref) / Ref * 100\%$
 DUT: Main display value of tested object
 Ref: The reference value that have been set.
 If DUT > DUT or DUT < DUT, "OL" will display on the secondary display and the main display will show measured value of tested object.

1) Access REL Mode

Press "FUNC" button to select desired "AUTO L", "AUTO C", "AUTO R" or "AUTO DCR" mode. Connected tested object to input terminals. Press REL button to access REL% mode. Δ appears on the LCD, main display shows measured component value and secondary display shows % of deviation. Press REL again, the reference value shows on main display and Δ icon flashes. % value still shows on the secondary display. Press REL button again to return to normal REL% measurement mode.

2) Exit REL% Mode

Long press "REL" button to exit REL% measurement and return normal mode.

6. Sorting measurement

Sorting Mode is used to quickly select components with a specified limit. Press "FUNC" to select "AUTO L", "AUTO C", "AUTO R" or "AUTO DCR" desired mode. Connected tested object to input terminals. Long press "FREQ" for about 2 seconds to access sorting mode. "Sorting" appears on LCD. "PASS" shows on main display, and measured component value shown on secondary display is set to nominal value. Then connect another component. "PASS" will show if the component falls within the set limit and measured value shows on the secondary display. The buzzer sounds one time. If it is out of scope, "FAIL" shows and measured component value.

1) Set up sorting tolerance
 Sorting tolerance can be settable to ±0.25%, ±0.5%, ±1%, ±2%, ±5%, ±10%, ±10%, ±20%, ±80%, ~20%. The meter defaults at ±1%. To set up the sorting, get the meter under sorting mode first, then press "SETUP". "Range" icon flashes on the LCD, press "ENTER" button to confirm and set the main display parameter. The last digit of the parameter flashes, press "▲" to decrease/increase the digit or "▼" to select another flashing digit for the adjustment. Then press "ENTER" to enter into tolerance setup. "TOL: ±1%" icon flashes on LCD. Press " / " to adjust the tolerance. Press "ENTER" to confirm and you can begin the sorting measurement.

2) Exit sorting mode

Press "Sorting" to exit sorting measurement and return to normal mode.

7. Calibration function

Calibration function can reduce effectively stray impedance caused by test wires. The meter offers short and open calibration. Short calibration is to remove impact of contact resistance and test wire resistance that interferes low impedance measurement, and open calibration is to remove stray capacitance and resistance of test wire that interferes high impedance measurement.

1) Indicate calibration function
 Power on the meter and long press "CAL" button to access open calibration, "OFF" shows on secondary display.(See Figure 4), then press "CAL" button again to begin the calibration, the meter will count down 30 seconds on LCD, when it is zero, "PASS" icon appears.(See Figure 5).



Figure 4



Figure 5

It indicates open calibration has finished. Then press "CAL" button and "5/F" appears on the secondary display.(See Figure 6). Insert short-circuit device into input terminals, press "CAL" button to begin, then the meter count down from 30seconds to zero, "PASS" shows.(See Figure 7), indicating short calibration has completed. Press "CAL" button again to return to normal measurement mode.



Figure 6



Figure 7

Note: If LCD shows "FRL" under open calibration mode.(See Figure 8).



Figure 8

It indicates the calibration failed, please check whether input terminals are opened or not. Make sure the circuit is open and do the calibration again.

If LCD shows "FRL" under short calibration mode (See Figure 9).

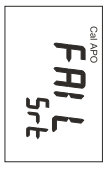


Figure 9

It indicates the calibration failed. Please check if the short-circuit device has been inserted into the input terminals. Make sure the terminals are stored and do the calibration gain.
 8. PC communication
 Press "USB" button to access communication function, and " " displays on LCD. Connect the meter to PC using USB wire and run the meter software on PC to start data transfer.
 Press "USB" button again to exit and stop the data transfer.

9. Backlight
 Long press "LIGHT" button to turn on/off LCD backlight. The backlight will switch off automatically after 60 seconds.

10. Auto power off
 Power off after about 5 minutes of idling

X. Quick Application

1. Selection of serial/parallel mode
 Suitable equivalent mode can be selected to gain more precise measurement suitable equivalent mode. In general, it is suggested to select serial equivalent mode for low-impedance element (such as less than 100Ω). It is suggested to select parallel equivalent mode for high-impedance element (such as more than 10 kΩ)

- Inductance measurement
- Press "u" to power on.
- Press "FUNC" to display "LP" on LCD and select inductance measurement range.

3) Insert the inductor into input terminals or connect the inductor to the meter using the test clamp.(See Figure 10).
 4) Press "FREQ" key to select suitable testing frequency.
 5) Press "D/C" to select auxiliary parameter to measure.

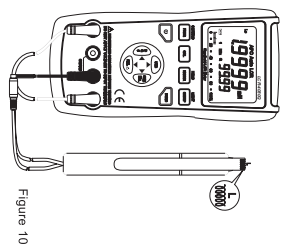


Figure 10

- Capacitance measurement
 Warning: Capacitance must be discharged completely before measurement.
 1) Press "u" to power on.
 2) Press "FUNC" to display "CP" on LCD and select capacitance measurement range.
 3) Insert the capacitor into input terminals or connect the capacitor to the meter using the test clamp (See Figure 11).
 4) Press "FREQ" key to select suitable testing frequency.
 5) Press "D/C" to select auxiliary parameter to measure.

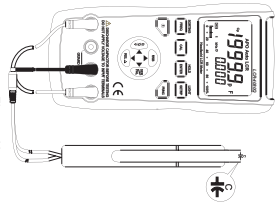


Figure 11

- Resistance measurement
 1) Press "u" to power on.
 2) Press "FUNC" to display "Rp" on LCD and select resistance measurement range.
 3) Insert the resistor into input terminals or connect the resistor to the meter using the test clamp.(See Figure 12).
 4) Press "FREQ" key to select suitable testing frequency.

Note:

When measuring resistance under auto mode, the secondary parameter B will be activated. If under manual mode, secondary parameter of resistance will be neglected.

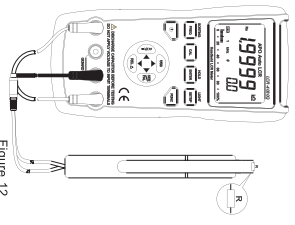


Figure 12

- DCR measurement
 1) Press "u" to power on.
 2) Press "FUNC" to display "DCR" on LCD and select DCR measurement range.
 3) Insert the resistor into input terminals or connect the resistor to the meter using the test clamp.(See Figure 13).

Note:

The secondary parameter and the frequency is negligible under DCR measurement and doesn't show on LCD

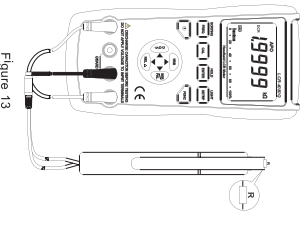


Figure 13

XI. PC Communication Protocol

Turn on communication function, connect the meter to PC using USB wire and begin the data transfer.

- Communication parameters:
- Baud rate: 9600
 - Data bit: 8
 - Start bit: 1
 - Stop bit: 1
 - Parity: None

Refer to connection diagram on the right:



XII. Technical Indicators

Note:

- Testing ambient temperature: 23°C ±5°C; Humidity: =75% R.H
- Warm up for 10 minutes before test.
- Test on the meter's terminals.
- Perform short/open calibration before testing.
- Measurement accuracy is not provided in the table below regarding the actual measurement that have gone beyond the specifications of the table.

Function	Measurement mode	Frequency	Range	Min. resolution	Accuracy: ±1.5% of reading ±1 digit (under 10°C to 30°C)
Inductance	Ld,lp	100Hz/170Hz	20.000mH	1uH	±1.10%±5
			200.000mH	0.01mH	±1.05%±5
			2000.00mH	0.1mH	±1.05%±5
			20000.0mH	1mH	±1.05%±5
Inductance	Lp	100Hz	200.00uH	0.01uH	±1.10%±5
			2000.00uH	0.01uH	±1.05%±5
			20000.0uH	0.1uH	±1.05%±5
			200000.0uH	1uH	±1.05%±5
Inductance	Lp	1000Hz	200.00uH	0.01uH	±1.20%±5
			2000.00uH	0.01uH	±1.20%±5
			20000.0uH	0.1uH	±1.20%±5
			200000.0uH	1uH	±1.20%±5

Note: The precision is evaluated if D is less than 0.1, $A_{rel} = A_{rel} \sqrt{1+D^2}$. If D exceeds 0.1, (Ae Precision)

Function	Measurement mode	Frequency	Range	Min. resolution	Accuracy: ±1.5% of reading ±1 digit (under 10°C to 30°C)
Resistance	R	100Hz/170Hz	20.000uΩ	1μΩ	±1.20%±5
			200.000uΩ	0.01mΩ	±1.05%±5
			2000.000uΩ	0.1mΩ	±1.05%±5
			20000.000uΩ	1mΩ	±1.05%±5
Resistance	Rp	100Hz	200.000uΩ	0.01uΩ	±1.10%±5
			2000.000uΩ	0.01uΩ	±1.05%±5
			20000.000uΩ	0.1uΩ	±1.05%±5
			200000.000uΩ	1uΩ	±1.05%±5
Resistance	Rp	1000Hz	200.000uΩ	0.01uΩ	±1.20%±5
			2000.000uΩ	0.01uΩ	±1.20%±5
			20000.000uΩ	0.1uΩ	±1.20%±5
			200000.000uΩ	1uΩ	±1.20%±5

Note: The precision is evaluated if D is less than 0.1, $A_{rel} = A_{rel} \sqrt{1+D^2}$. If D exceeds 0.1, (Ae Precision)

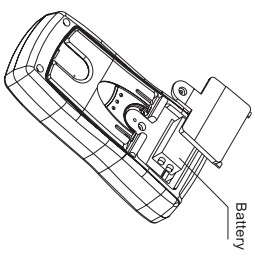
Function	Measurement mode	Frequency	Range	Min. resolution	Accuracy: ±1.5% of reading ±1 digit (under 10°C to 30°C)
Resistance	R	100Hz/170Hz	200.000Ω	0.01Ω	±1.10%±5
			2000.000Ω	0.1mΩ	±1.05%±5
			20000.000Ω	1mΩ	±1.05%±5
			200000.000Ω	10Ω	±1.05%±5
Resistance	Rp	100Hz	200.000Ω	0.01Ω	±1.10%±5
			2000.000Ω	0.1Ω	±1.05%±5
			20000.000Ω	1Ω	±1.05%±5
			200000.000Ω	10Ω	±1.05%±5
Resistance	Rp	1000Hz	200.000Ω	0.01Ω	±1.20%±5
			2000.000Ω	0.1Ω	±1.20%±5
			20000.000Ω	1Ω	±1.20%±5
			200000.000Ω	10Ω	±1.20%±5

Resistance	10Ω	0.1Ω	±1.05%±5
20.000Ω	0.01Ω	0.1Ω	±1.05%±5
200.000Ω	0.1Ω	1Ω	±1.05%±5
2000.000Ω	1Ω	10Ω	±1.05%±5

Note: The precision is evaluated if D is less than 0.1, $A_{rel} = A_{rel} \sqrt{1+D^2}$. If D exceeds 0.1, (Ae Precision)

XIV. Battery Replacement

Warning
 Please replace battery in a timely manner. When " " prompt shows on the LCD to avoid any impact on measurement accuracy.
 Please replace old battery by alkaline call of 9V.



Battery

XV. Maintenance

- Cleaning
 Please power off and remove battery and external power before cleaning. Clean the meter with soft cloth and mild detergent. Prevent the detergent from going inside the meter. Please use the meter only after it is completely dry.
- Moisture prevention
 Please use and store the meter in dry environment. Power it off and remove the battery quickly if the water goes inside the casing accidentally. Do not disassemble the meter randomly. Have the meter checked or serviced by your dealer or service personnel.
- Repair
 If the meter cannot power on, please inspect the battery, external power and power input terminal for any anomaly. Check whether POWER button is valid or not.
 If the measurement does not work normally, please check if the test wires are in good condition. component pin has been well connected with the spring pieces inside input terminals. Please make sure the meter is properly operated. If any servicing is needed, please contact your dealer or the service center of our company, do not disassemble the meter or replace the components or change the circuits randomly.

"END"
 The Operating Manual will change without notice!