

Meiruike Instruction Manual

RK2811D LCR METER

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Warranty

This REK instrument product is warranted against defects in material and workmanship for a period of one year from the date of shipment. Other items such as test fixtures, test cables are warranted for 90 days from the date of shipment. During the warranty period, we will, at our option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by REK. Purchaser shall prepay shipping charges to REK and REK shall pay for the return of the product to Buyer. However, Buyer shall pay all shipping charges, duties, taxes, and any other charges for products returned to REK from another country.

Limitation of Warranty

This warranty does not apply to defects resulting from improper or inadequate maintenance and care by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. REK specially disclaims the implied warranties of merchant ability and fitness for a particular use.

REK's responsibility to repair or replace defective products is the sole and exclusive remedy provided to the customer for breach of this warranty. REK shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Safety Precautions

The following safety precautions must be observed to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, read the operating information carefully before using the product and use this product only as specified.

NOTE: This product complies with INSTALLATION CATEGORY I as well as POLLUTION DEGREE 2. This product is an INDOOR USE product.

Ground the Instrument

Before operating the instrument, make sure the instrument chassis is grounded with the 3-pole power cable.

Don't operate in an explosive atmosphere

To prevent explosion or file, don't operate the instrument in the presence of inflammable gases or fumes.

Use the proper fuse

Replace the broken fuse with the same type and rating for continuous protection against fire hazard.

Keep away from live circuits

Don't remove the instrument covers when operating the instrument. Component replacement and internal adjustment can only be done by qualified personnel. Don't replace components with the power cable connected. Dangerous voltage may remain even after the power cable has been disconnected. Always remove the power cable from the instrument and discharge circuits before touching them.

Chapter 1 Preparation

This chapter provides the information necessary for performing an incoming inspection and setting up the instrument before operation.

1.1 Unpacking and Inspection

Thank you for purchasing and using our product. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the 2811D has been checked mechanically and electrically. The contents of the shipment should be as listed in the packing list. If the contents are incomplete, if there is mechanical damage or defect, if the instrument does not work normally, notify our company or our local representative. Keep the shipping container and packing material for future use such as returning for re-calibration or service.

1.2 Power Requirements

(1) Voltage: 198 to 242 Vac,
 (2) Frequency: 47.5 to 63 Hz
 (3) Power: 20 VA maximum

- (4) In accordance with internal safety standards, this instrument is equipped with a threewire power cable. When connected to an appropriate ac power outlet, this cable grounds the instrument frame.
- (5) The instrument is carefully designed in order to reduce the disturbance induced by AC power supply, however, low noise environment is recommended. Sometimes a power source filter is needed.

Warning: For protection from electrical shock, the power cable ground must not be defeated. The power plug must be plugged into an outlet that provides a protective earth ground connection.

1.3 Fuse Selection

The instrument has been equipped with the 500 mA fuse before leaving factory. Use only fuses with the required current rating and of the specified type as replacements. Do not use a mended fuse or short-circuit the fuse-holder in order to by-pass a blown fuse. Find out what caused the fuse to blow!

1.4 Operation Environment

- (1) The Please do not operate the instrument in places where there is dusty, vibrant, under direct sunlight, or where there is corrosive air.
- (2) In order to maintain good measurement accuracy, the 2811D must be operated under the following environment conditions:

Temperature: 0°C ~ 40°C

Humidity: $\leq 75\%$ RH at 40° C.

- (3) The instrument is carefully designed in order to reduce the disturbance induced by AC power supply, however, low noise environment is recommended. Sometimes a power source filter is needed.
- (4) Please store the instrument in the place where the temperature is between 5°C and 40°C, humidity is less than 85% RH. If the instrument will not be put in use for a time, please have it properly packed with its original box or a similar box for storage.
- (5) The instrument, especially the test leads, should be kept far away from strong electromagnetic field to avoid interference with measuring precision.

1.5 Use Test Fixture

Original test fixture and test clip leads should be used in order to ensure correct and accurate measuring results. At the same time, test fixture, test clip leads and pins of DUT should be kept clean in order to connect well between DUT and test fixture. Test fixture and test clip leads are connected to Hcur, Hpot, Lcur and Lpot 4 terminals on the front panel.

For DUT which has shield, please connect the shield to the ground terminal "," of the instrument.

1.6 Warm-up and Continuous Working Time

Warm up the instrument for a minimum time of 15 minutes in order to ensure measuring precision.

Continuous working time should be less than 16 hours.

1.7 Other features

(1) Power consumption: ≤20VA

(2) Dimension(W*H*D): 310mm*105mm*295mm

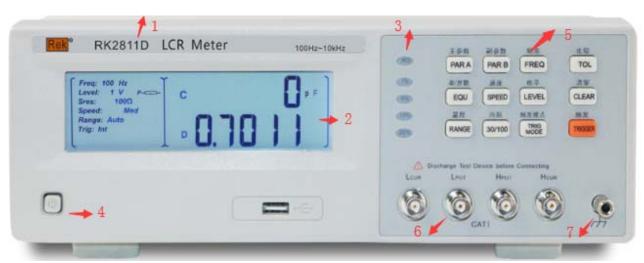
(3) Weight: about 3.5kg

Chapter 2 Panel Description

This chapter provides information including a tour of the front and rear panel and display area definition, which will help you to quickly learn how to operate the 2811D.

2.1 A Tour of the Front Panel

Figure 2-1 shows the brief description of each key on the 2811D's front panel.



(1) Brand and Model

Mark and model of instrument

(2) LCD

Display the measurement results and test conditions, etc.

(3) Comparator Indication

Display the comparator sorting results: NG, 1%, 5%, 10%, and 20%.

(4) Power on/off

Power on/off switch. In the "ON" position all operating voltages are applied to the instrument. In the "OFF" position NO operating voltages are applied to the instrument.

(5) Keys

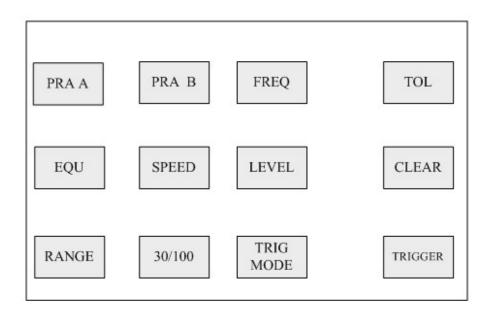


Figure 2-2 Keyboard

a) **PAR A** key:

The function is the setup key of main test parameter.

b) **PAR B** key:

The function is the setup key of second test parameter.

c) **FREQ** key:

The function is the setup key of test frequency.

d) **TOL** key:

The function is the setup key of comparator..

e) **EQU** key:

The function is the equivalent circuit setup key.

f) **SPEED** key:

The function is the setup key of measurement speed.

g) **LEVEL** key:

The function is the setup key of test voltage level.

h) **CLEAR** key:

The function is the setup key of correction function.

i) **RANGE** key:

The function is the setup key of range HOLD or AUTO.

j) **30/100** key:

The function is signal source output impedance setup key.

k) **TRIG MODE** key:

The function is the trig mode setup key.

I) TRIGGER key:

The function is the trigger key.

(6) Test Terminals

There are 4 test terminals used to connect a 4-terminal test fixture or test leads for measuring the device under test.

H_{CUR}: High currentH_{POT}: High potentialL_{POT}: Low potentialL_{CUR}: Low current

(7) Frame Terminal

This is the frame terminal which is tied to the instrument's chassis and which can be used for measurements that require guarding.

2.2 A Tour of the Rear Panel

Figure 2-3 shows a brief description of the 2811D's rear panel.



(1) Name Plate

Name plate is used to provide the information of date, model, lot number and manufacturer etc.

(2) Line Input Receptacle and Fuse Holder

AC power cord receptacle.

(3) Fuse Holder

Fuse holder for RK2811D's power supply.

2.3 Display Area Definition

Figure 2-4 shows the display area definition of the RK2811D LCD screen.

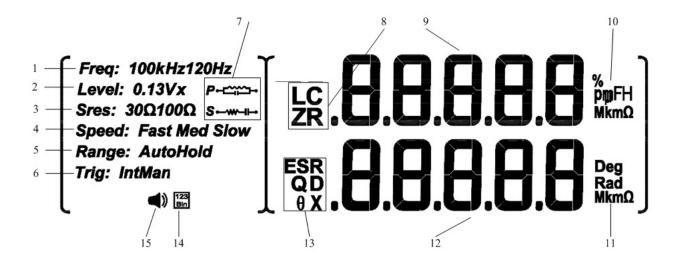


Figure 2-4 Display Area Definition

(1) Test Signal Frequency Indication

"100 Hz" is on: The current test signal frequency is 100 Hz.
"120 Hz" is on: The current test signal frequency is 120 Hz.
"1 kHz" is on: The current test signal frequency is 1 kHz.
"10 kHz" is on: The current test signal frequency is 10 kHz.

(2) Test Signal Level Indication

"0.1 V" is on: The current test signal voltage is 0.1 V.
"0.3 V" is on: The current test signal voltage is 0.3 V.
"1.0 V" is on: The current test signal voltage is 1.0 V.

(3) Signal Source Output Impedance Indication

"30Ω" is on: Signal source output impedance is 30 Ω. "100Ω" is on: Signal source output impedance is 100 Ω.

(4) Measurement Speed Indication

"Fast" is on: Fast measurement speed"Med" is on: Medium measurement speed

"Slow" is on: Slow measurement speed

(5) Range Indication

Indicate the current ranging mode and the current range number.

"Auto" is on: Range AUTO "Hold" is off: Range HOLD

(6) Trigger Mode Indication

"Int" is on: Internal trigger mode "Man" is on: Manual trigger mode

(7) Equivalent Circuit Mode Indication

"S---" is on: Series equivalent circuit mode.

"P---" is on: Parallel equivalent circuit mode.

(8) The primary Parameter Indication

Indicate the current measuring primary parameter user selected.

"L:" is on: Inductance is measured and displayed.

"C:" is on: Capacitance is measured and displayed.

"R:" is on: Resistance is measured and displayed.

"Z:" is on: Impedance is measured and displayed.

(9) The Primary Parameter Display

Display the current measurement result of the primary parameter.

(10) Unit of The primary Parameter Indication

Indicate the current unit of measurement result of the primary parameter.

Unit of inductance: µH, mH, H.

Unit of capacitance: **pF**, **nF**, **µF**, **mF**.

Unit of resistance/impedance: Ω , $k\Omega$, $M\Omega$.

(11) Unit of The second Parameter Indication

Indicate the current unit of measurement result of the second parameter.

Unit of phase angle: Rad, Deg.

Unit of reactance / equivalent series resistance: $\mathbf{m} \Omega$, Ω , $\mathbf{k} \Omega$, $\mathbf{M} \Omega$.

(12) The Secondary Parameter Display

Display the current measurement result of the secondary parameter.

(13) The Secondary Parameter Indication

Indicate the current measuring secondary parameter user selected.

(14) Comparator Function Indication

"Is on: The comparator function is turned on.

"" is off: The comparator function is turned off.

(15) Alarm Indication

"sis on: Alarm buzzer is turned on.

"
"is off: Alarm buzzer is turned off."

Chapter 3 Operation

3.1 Power On

- 1) Press power switch to turn on the instrument.
- 2) Version number of the instrument is first displayed on the LCD screen.
- 3) The instrument enters the measurement status after a short delay. Figure 3.1 shows the information displayed in measurement status. It maybe different with the actual display due to different measurement setup.

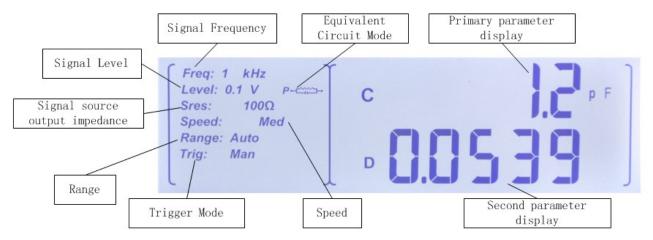


Figure 3.1 LCD Display in Measurement Status

3.2 Measurement Function

2811D measures two components of the complex impedance parameters at the same time in a measurement cycle. The primary and secondary measurement parameters are listed as follows.

■ Primary Parameter

L: Inductance

C: Capacitance

R: Resistance

|Z|: Absolute value of impedance

Secondary Parameter

D: Dissipation factor

Q: Quality factor

 θ : Phase angle

X: Reactance

ESR: Equivalent series resistance

|Z| is the absolute value of impedance, so it is always a positive value; While L/ C/ R maybe a positive value or sometimes a negative value.

When measurement function is C-D and the primary parameter measurement result is

negative, this means the component under test is probably an inductor.

When measurement function is L-Q and the primary parameter measurement result is negative, this means the component under test is probably a capacitor.

When measurement function is R-Q and the measurement result of resistor is negative, this is due to over zero correction, please perform open and short correction correctly.

2811D provides 4 combinations of primary and secondary parameters:

- L-Q
- C-D
- R-X
- **■** Z-θ

Perform the following steps to set the measurement function.

- 1. Assume that current measurement function is L-Q. Primary parameter indication is "L", secondary parameter indication is "Q".
- 2. Press **PAR A** key, measurement function is changed to C-D. Primary parameter indication is "**C**", secondary parameter indication is "**D**".
- 3. Press **PAR A** key, measurement function is changed to R-X. Primary parameter indication is "**R**", secondary parameter indication is "**X**".
- 4. Press **PAR A** key, measurement function is changed to Z-θ. Primary parameter indication is "**Z**", secondary parameter indication is "**θ**".
- 5. Keep on pressing **PAR A** key, until the measurement function required is indicated.
- 6. Keep on pressing PAR B key, until the secondary parameter required is indicated.

3.3 Test Frequency

2811D provides 4 typical frequency points:100Hz, 120Hz, 1kHz and 10kHz. The current test frequency is displayed on the LCD.

Perform the following steps to set the test frequency.

- 1. Assume the current test frequency of the instrument is 100Hz. "**100Hz**" is indicated on the LCD.
- 2. Press **FREQ** key, test frequency is changed to 120 Hz, and "**120Hz**" is indicated on the LCD.
- 3. Keep on pressing **FREQ** key, until the test frequency required is indicated on the LCD.

3.4 Test Signal Level

2811D provides 3 kinds of test signal voltage levels: 0.1V_{RMS}, 0.3 V_{RMS} and 1.0 V_{RMS}.

Perform the following steps to set the test signal level.

1. Assume the current test signal level 1.0V, and "1.0V" indicated on the bottom of LCD.

- 2. Press **LEVEL** key, test signal level is changed to 0.1V, and "**0.1V**" is indicated on the LCD.
- 3. Press **LEVEL** key, test signal level is changed to 0.3V, and "**0.3V**" is indicated on the LCD.
- 4. Press **LEVEL** key, test signal level is changed back to 1.0V, and "**1.0V**" is indicated on the LCD.
- 5. Keep on pressing **LEVEL** key, until the test signal level required is indicated on the LCD.

3.5 Measurement Speed

2811D provides 3 kinds of measurement speeds: Fast, Med and Slow. Generally, a slow measurement speed will result in more stable and accurate measurement results.

■ Fast: 20 meas/sec■ Med: 7 meas/sec■ Slow: 3 meas/sec

Perform the following steps to set the measurement speed

- 1. Assume the current measurement speed is FAST, and "FAST" is indicated on the LCD.
- 2. Press **SPEED** key, the measurement speed is changed to MED, and "**MED**" is indicated on the LCD.
- 3. Press **SPEED** key, the measurement speed is changed to SLOW, and "**SLOW**" is indicated on the LCD.
- 4. Press **SPEED** key, the measurement speed is changed back to FAST, and "**FAST**" is indicated on the LCD.
- 5. Keep on pressing **SPEED** key, until the measurement speed required is indicated on the LCD.

3.6 Equivalent Circuit

3.6.1 Series and Parallel Circuit Setup

2811D provides the series and parallel equivalent circuit modes for measuring the L, C, and R.

Perform the following steps to set the equivalent circuit mode

1. Press <u>EQU</u> key to switch between the series mode and parallel mode, and the current equivalent circuit mode is displayed on the bottom of LCD.

3.6.2 How to Select the Measurement Circuit Mode

Guide lines for selecting the capacitance measurement circuit mode.

Small capacitance yields large reactance, which implies that the effect of the parallel resistance has relatively more significance than that of series resistance. The low value

of the series resistance has negligible significance compared with the large capacitive reactance, so the parallel circuit mode should be used.

Large capacitance yields small reactance, which implies that the effect of the series resistance has relatively more significance than that of parallel resistance. The large value of the parallel resistance has negligible significance compared with the low capacitive reactance, so the series circuit mode should be used.

The following is a rule of thumb for selecting the circuit mode according to the impedance of the capacitor.

♦ Above approx. $10k \Omega$: use parallel circuit mode \$\Delta\$ Below approx. 10Ω : use series circuit mode

♦ Between above values: follow the manufacturer's recommendation

■ Guide lines for selecting the inductance measurement circuit mode.

The reactance of a large inductance at a given frequency is relatively large (compared with that of a small inductance), so the parallel resistance becomes more significant than the series component. So, a measurement in the parallel equivalent circuit mode is more suitable.

Conversely, for low values of inductance the reactance becomes relatively small (compared with that of a large inductance), so the series resistance component is more significant. So, the series equivalent circuit mode is the appropriate choice.

The following is a rule of thumb for selecting the circuit mode according to the impedance of the inductor.

→ Below approx. 10 Ω: use series circuit mode
 → Above approx. 10k Ω: use parallel circuit mode

Between above values: follow the manufacturer's recommendation

3.7 Signal Source Output Impedance

2811D provides two different signal output impedance 30Ω and 100Ω . The measurement current through the DUT will be different with different signal output impedance under the test same signal voltage level. The current sensitive components, for example the inductors with cores, will get different measurement results under different signal source output impedance. In order to be compatible with other well-known instruments in the world, use the same signal source output impedance for each instrument.

Perform the following steps to set the signal source output impedance

1. If "100 Ω " is displayed on the LCD, this means the current signal source output impedance is 100 Ω .

- 2. Press 30/100 key to set the current source output impedance to 30Ω , and " 30Ω " will be displayed on the LCD.
- 3. Repeat step 2 and 3, signal source output impedance will be switched between 30Ω and 100Ω .

3.8 Measurement Range

Perform the following steps to set the measurement range

1. Assume the current measurement range is set to "Auto" status. Press **RANGE** key to change the measurement range from the "Auto" mode to the "Hold" mode. When the measurement range is set to the "Hold" mode, "**Auto**" is turned off from the LCD, the impedance range is fixed at the current range setting.

3.9 Trig Mode

2811D provides 4 kinds of trig modes:

INT : Internal trigger modeMAN: Manual trigger mode

Performing the following steps to set the measurement mode:

Press TRIG MODE key to switch trig mode between INT and MAN, and the current measurement mode will be displayed on LCD.

3.10 Comparator Function

2811D's built-in comparator can sort devices into a maximum of 5 bins (1%, 5%, 10%,20% and NG) using a maximum of four pairs of primary limits.

Perform the following steps to set the comparator function to ON or OFF

- 1. Assume the instrument's comparator function is OFF. "" will not be displayed on the LCD, and sorting results will not be displayed on the top of LCD or indicated by the LEDs on the front panel.
- 2. Press TOL key, ""and "" will be displayed on the LCD. This means comparator function is turned ON and the readings of the main parameter is recorded as the norminal value. Sorting results will be displayed on the LCD and indicated by LEDs on the front panel at the same time.

3.11 Correction

2811D's OPEN correction capability cancels errors due to the stray admittance (G, B) in parallel with the device under. 2811D's SHORT correction capability corrects for the residual impedance (R, X) in serial with the device under test.

Perform following steps for the open and short correction:

- 1. When the 2811D is under the measurement status, Press CLEAR key to enter the correction function.
- 2. If the fixture is open, the information shown in Figure 3-2 will be displayed.



Figure 3.2 Open Correction

- 3. Press CLEAR key to cancel correction and return to the measurement status.
- 4. Press TRIGGER key to start open correction measurement.
- 5. The OPEN correction is performed at all frequency points and ranges. The current frequency and range being corrected are displayed on the bottom of LCD.
- 6. 2811D judges the results of correction measurement automatically. If the current correction result is not correct, 2811D will interrupt the current correction operation and return to the measurement status.
- 7. If the current correction result is correct, "PASS" will be displayed on the secondary parameter display area. Then 2811D continues correction with the following frequency points and ranges.
- 8. The instrument will return to measurement status after the open correction is successfully completed.
- 9. If short correction is to be performed, short the measurement contacts of the fixture together with a low impedance shorting plate. The information shown in Figure 3-3 will be displayed.



Figure 3.3 Short Correction

- 10. Press TRIGGER key to start short correction measurement.
- 11. The SHORT correction is performed at all frequency points and ranges. The current frequency and range being corrected are displayed on the bottom of LCD.
- 12. 2811D judges the results of correction measurement automatically. If the current correction result is not correct, 2811D will interrupt the current correction operation and return to the measurement status.
- 13. If the current correction result is correct, "**PASS**" will be displayed on the secondary parameter display area. Then 2811D continues correction with the following frequency points and ranges.
- 14. The instrument will return to the measurement status after the short correction is successfully completed.
- 15. If a DUT is connected to the test fixture, or the fixture is not opened or shorted reliably, the instrument will not perform open or short operation. The information shown in figure 3-4 will be displayed. Press CLEAR key to return to the measurement status.



Figure 3.4 Exit Correction

Notice:

- Please perform the OPEN and SHORT correction again, when one of the following test conditions is changed.
 - ♦ Test fixture
 - ♦ Environment temperature and humidity
 - ♦ Signal source output impedance
 - ♦ Test signal voltage level
- If you press CLEAR key to interrupt the current correction process and return to the measurement status. The origin correction data will not be change.
- If "FAIL" is displayed during the short correction measurement. This is probably because the fixture contacts are not shorted with the low impedance shorting plate, or the fixture is not shorted reliably. Just short the fixture carefully and perform the short correction again.
- Correction data under different test level, frequency and output impedance are stored separately in the non-volatile memory. It is not necessary to correction again under the same test conditions.
- 2811D selects the OPEN or SHORT correction operation according to the current measured impedance automatically. If there is a component in the test fixture or if the fixture is not shorted or opened reliably, "QUIT" will be displayed in the second parameter display area.

Chapter 4 The Specifications

The complete 2811D specifications are listed below. These specifications are the performance standards. When shipped from the factory, the 2811D meets the specifications listed in this section.

4.1 Measurement Functions

- 1. Primary measurement parameters
 - L: Inductance
 - C: Capacitance
 - R: Resistance
 - |Z|: Absolute value of impedance
- 2. Secondary measurement parameters
 - D: Dissipation
 - Q: Quality
 - \blacksquare θ : Phase angle
 - X : Reactance
 - ESR: Series equivalent resistance
- 3. Combinations of measurement parameters
 - L-Q
 - C-D
 - R-Q
 - Z-Q

4.2 Equivalent Measurement Circuit

SER: Series equivalent circuitPAR: Parallel equivalent circuit

The actual capacitor, resistor and inductor are not the ideal capacitor, resistor and inductor. Normally, a component has the characteristics of the resister and the reactor at the same time. The actual component is composed of an ideal resistor and a reactor (ideal inductor or capacitor) in series or parallel equivalent circuits.

The value in the two different equivalent circuits can be converted to each other using the following formulas in Table 6-1. The values of L and C in two different equivalent circuits are different due to the quality factor Q (or the dissipation factor D). But D and Q always have the same value in both equivalent circuit modes.

Table 6-1 Equivalent Circuit Transform

Circuit Mode		Dissipation Factor	Transform	
L	Lp ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	D=2πf Lp/Rp=1/Q	Ls=Lp/(1+D 2) Rs=RpD 2 /(1+D 2)	
	Ls Rs	D=Rs/2πfLs=1/Q	Lp= $(1+D^2)$ Ls Rp= $(1+D^2)$ Rs/ D^2	
С	Rp Cp	D=1/2πfCpRp=1/Q	$Cs=(1+D^2)Cp$ $Rs=RpD^2/(1+D^2)$	
	Cs Rs	D=2πfCsRs=1/Q	$Cp=Cs/(1+D^2)$ $Rp=Rs(1+D^2)/D^2$	

Q, D and Xs are defined as follows

Q=Xs/Rs

D=Rs/Xs

 $Xs=1/2\pi fCs=2\pi fLs$

Where, Suffix s means series circuit mode, and suffix p means parallel circuit mode. Generally, for low impedance component (such as large capacitor or small inductor), the series equivalent circuit mode should be used. While for high impedance component (such as small capacitor or large inductor), the parallel equivalent circuit mode is the appropriate choice. We also select the equivalent circuit mode according to the actual usage in different circuits. If a capacitor is used as a filter capacitor, series circuit mode is the best choice. If a capacitor is used in a LC oscillator, then the parallel circuit mode should be selected.

4.3 Measurement Range

When 2811D is operated under 100Ω signal source output resistance, 5 ranges are available: 30Ω , 100Ω , $1k\Omega$, $10k\Omega$ and $100k\Omega$. When 2811D is operated under 30Ω signal source output resistance, 6 ranges are available: 10Ω , 30Ω , 100Ω , $1\ k\Omega$, $10\ k\Omega$ and $100\ k\Omega$. Range AUTO or range HOLD mode can be selected for measurement ranging operation.

4.4 Trigger Mode

2811D provides 2 kinds of trigger modes for selection. They are Internal and Manual,

- Internal: When the measurement mode is set to "Int", 2811D is triggered automatically. 2811D performs measurements continuously.
- Manual: When the measurement mode is set to "Man", 2811D performs a single measurement every time when TRIGGER key on the panel is pressed.

4.5 Measurement Terminals

4 Measurement Terminals

H_{CUR}: High currentH_{POT}: High potentialL_{POT}: Low potentialL_{CUR}: Low current

4.6 Measurement Speed

2811D's measurement speed is determined by integration time, measurement result display time, ranging mode and comparator on/off etc. Three kinds of measurement speeds can be selected by user, FAST, MED and SLOW. Generally, slower measurement speed will result in more stable and accurate measurement results.

FAST Speed: 20 meas/sec MED Speed: 7meas/sec SLOW Speed: 3 meas/sec

4.7 Basic Accuracy

```
C: 0.2% (1+ Cx/Cmax+ Cmin/Cx )(1+Dx )(1+ks+kv+kf);
```

- L: 0.2% (1+ Lx/Lmax+ Lmin/Lx)(1+1/Qx)(1+ks+kv+kf);
- Z: 0.2% (1+ Zx/Zmax+ Zmin/Zx)(1+ks+kv+kf);
- R: 0.2%(1+ Rx/Rmax+ Rmin/Rx)(1+Qx)(1+ks+kv+kf);
- D: $\pm 0.0020(1 + Zx/Zmax + Zmin/Zx)(1 + Dx + Dx^2)(1 + ks + kv + kf)$;
- Q: $\pm 0.0015(1+Zx/Zmax+Zmin/Zx)(Qx+1/Qx)(1+ks+kv+kf)$; where.
 - 1. D, Q is the absolute deviation, the rest are the percent deviations, Dx=1/Qx;
 - 2. Parameters with suffix "x" are measured results. Parameters with suffix "max" are the maximum values listed in Table 6-2. Parameters with suffix "min" are the minimum values listed in Table 6-2.
 - 3. ks is the speed factor, kv is the voltage level factor, kf is the frequency factor.
 - 4. When calibration measurement is performed, reliable open and short corrections

should be taken for better measurement accuracy.

4.7.1 Maximum and Minimum Values Used for Accuracy Calculation

Table 6-2 Maximum and Minimum values

Parameter	Frequency			
	100Hz	120Hz	1kHz	10kHz
Cmax	800μF	667μF	80μF	8μF
Cmin	1500pF	1250pF	150pF	15pF
Lmax	1590H	1325H	159H	15.9H
Lmin	3.2mH	2.6mH	0.32mH	0.032mH
Zmax	1ΜΩ			
Zmin	1.59Ω			

4.7.2 Measurement Speed Factor ks

Slow: ks=0; Medium: ks=0; Fast: ks=10.

4.7.3 Measurement Voltage Level Factor kv

1.0Vrms: kv=0; 0.3Vrms: kv=1; 0.1Vrms: kv=4.

4.7.4 Measurement Frequency Factor kf

f =100Hz、120Hz、1kHz: kf=0; f=10kHz kf=0.5;

4.8 Measurement Frequency

2811D provides 4 kinds of test frequencies: 100Hz, 120Hz, 1kHz and 10kHz.

Accuracy: $\pm 0.02\%$

4.9 Test Signal Level

0.1 Vrms±10%

0.3 Vrms±10%

1.0 Vrms±10%

4.10 Output Impedance

30Ω±5% 100Ω±5%

4.11 Display Range

Parameter	Frequency	Measuring		
	100Hz、120Hz	1μH to 9999H		
L	1kHz	0.1μH to 999.9H		
	10kHz	0.01μH to 99.99H		
	100Hz、120Hz	1pF to 19999μF		
С	1kHz	0.1pF to 1999.9μF		
	10kHz	0.01pF to 19.99μF		
R,Z、	X、ESR	0.1 m Ω to 99.9 M Ω		
Q		0.0001 to 9999		
	D	0.0001 to 9.999		

4.12 Correction Function

Open Correction

Open correction eliminates measurement errors due to parasitic stray impedances of the test fixture.

Short Correction

Short correction eliminates measurement errors due to parasitic residual impedances of the test fixture.

4.13 Comparator Function

2811D's built-in comparator can short devices into a maximum of 5 bins (1%, 5%, 10%,20% and NG) using a maximum of four pairs of primary limits.

4.14 Ranging Mode

AUTO:

2811D automatically selects the appropriate range according to the DUT's impedance.

HOLD:

The measurement range is fixed at the current setting.



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