DATA SHEET

Take your expectations higher with the latest LCR meters

U1730C Series Handheld LCR Meters

The Keysight Technologies, Inc. U1730C Series handheld LCR meters allow you to measure at frequencies as high as 100 kHz—a capability typically found only in benchtop meters. Get measurements done faster using the one-touch automatic identification function button which displays component type and more detailed component analysis such as Z, ESR, and DCR. Ideal for testing on the go, these LCR meters operate on a battery that lasts up to 16 hours. With the U1730C Series that is built for your convenience, you can perform quick and basic LCR measurements at an affordable price.



KEYSIGHT TECHNOLOGIES

Features

Key features

- 20,000 counts resolution
- 0.2% basic accuracy
- Wide LCR ranges with three to five selectable test frequencies (up to 100 kHz for U1733C)
- Auto identification (Ai) automatically determines and displays component type and measurements
- Detailed component analysis with DCR, ESR, Z, D, Q, and θ functions
- Battery life of 16 hours/AC-powered
- IR-to-USB connectivity for data logging to PC

Frequency up to 100 kHz

The test frequency now extends as high as 100 kHz, providing more flexibility to test a wider range of components. A higher test frequency, for example 100 kHz, is useful for applications such as testing aluminum electrolytic capacitors used in switching power supply circuits.

Automated identification

With Ai the testing and measuring experience is easy; eliminating unnecessary trial and error time—with just a single push of a button. This unique feature automatically specifies L, C, or R with parallel and series mode, without the need to manually change buttons.

Detailed component analysis

The handheld LCR meters allows you to test various component types, including secondary components of Dissipation Factor (D), Quality Factor (Q), and Angle Indication of Impedance (θ). This new handheld series also includes other functions that result in a more detailed component analysis. For example, the built-in Equivalent Series Resistance (ESR) function helps you better understand the inherent resistance behavior typically found in capacitors across selected frequencies. DCR is a built-in DC resistance measurement that eliminates the use of a separate digital multimeter (DMM) for component test.



Figure 1. Automate the recording of continuous readings when you hook the U1731C/U1732C/U1733C to a PC

Take a Closer Look



Visible and audible tolerance mode for component sorting

Maximum, Minimum and Average values recording

Ai helps identify L, C, and R components automatically according to level of impedance

ESR function for capacitance series resistance analysis

Auto calculation of Phase Angle, Dissipation Factor, and Quality Factor

To select desired Z, L, C, or R function

To enter rolerance range of 1%, 5%, 10%, and 20%

Backlight function to ease viewing in subdued lighting (only in U1732C/U1733C)

Secondary display

20,000 counts resolution

Data Hold function to freeze and save measured values

Allows manual or auto ranging to be used interchangeably

To select desired test frequency:
- U1731C: Up to 1 kHz
- U1732C: Up to 10 kHz
- U1733C: Up to 100 kHz

To enable DCR measurement (only in U1733C)

To enter relative mode and stores display reading as a reference value

Figure 2. Front view of the U1733C

U1731C/U1732C/U1733C Electrical Specifications

Accuracy is given as ± (% of reading + counts of least significant digit) at 23 °C ± 5 °C, with relative humidity less than 80%. Please refer to the User Guide about the measuring mode specified for each range of L/C/R, series or parallel mode. Measurements performed at the test socket and necessary Open and Short corrections must prior be done. The accuracy is verified by design and specified type tests.

Impedance/Resistance

		Accuracy = AZ + Offset					
Range	Resolution	U1731C/U1732C/U1733C			U1732C/U1733C		U1733C
		100 Hz	120 Hz	1 kHz	10 kHz	100 kHz	DCR[1]
2 Ω[1]	0.0001 Ω	0.7% + 50	0.7% + 50	0.7% + 50	0.7% + 50	1.0% + 50	0.7% + 50
20 Ω[1]	0.001 Ω	0.7% + 8	0.7% + 8	0.7% + 8	0.7% + 8	0.7% + 8	0.7% + 8
200 Ω[1]	0.01 Ω	0.2% + 3	0.2% + 3	0.2% + 3	0.2% + 3	0.5% + 5	0.2% + 3
2000 Ω	0.1 Ω	0.2% + 3	0.2% + 3	0.2% + 3	0.2% + 3	0.5% + 5	0.2% + 3
20 kΩ	0.001 kΩ	0.2% + 3	0.2% + 3	0.2% + 3	0.2% + 3	0.5% + 5	0.2% + 3
200 kΩ	0.01 kΩ	0.5% + 5	0.5% + 5	0.5% + 5	0.5% + 5	0.7% + 8	0.5% + 5
2000 kΩ	0.1 kΩ	0.5% + 5	0.5% + 5	0.5% + 5	0.7% + 5	NA	0.5% + 5
20 MΩ	0.001 MΩ	2.0% + 8	2.0% + 8	2.0% + 8	5.0% + 8	NA	2.0% + 8
200 MΩ	0.01 MΩ	6.0% + 80	6.0% + 80	6.0% + 80	NA	NA	6.0% + 80

Notes:
1. The accuracy for ranges 2 Ω to 200 Ω is specified after Null function which is used to subtract the resistance of test leads and the contact resistance
2. For ranges of 20 MΩ and 200 MΩ, the R.H is specified for < 60%
3. Resistance is specified to Q < 10 and D > 0.1, otherwise the accuracy is (AZ+Offset) x $\sqrt{(1+Q^2)}$
4. Equivalence Series Resistance (ESR) measurement is determined by impedance measurement and range. The maximum display is up to 199.99 kΩ and accuracy is (AZ+Offset) x $\sqrt{(1+Q^2)}$

Capacitance[3]

		Accuracy = AC + Offset				
Range	Resolution	U1731C/U1732C/U1733C			U1732C/U1733C	U1733C
		100 Hz	120 Hz	1 kHz	10 kHz	100 kHz
20 mF	0.001 mF	0.5% + 8	0.5% + 8	NA	NA	NA
2000 µF	0.1 µF	0.5% + 5	0.5% + 5	0.5% + 8	NA	NA
200 µF	0.01 µF	0.3% + 3	0.3% + 3	0.5% + 5	0.5% + 8	NA
20 µF	0.001 µF	0.2% + 3	0.2% + 3	0.2% + 3	0.5% + 5	5.0% + 10
2000 nF	0.1 nF	0.2% + 3	0.2% + 3	0.2% + 3	0.2% + 3	0.7% + 10
200 nF	0.01 nF	0.2% + 3	0.2% + 3	0.2% + 3	0.5% + 3	0.7% + 10
20 nF	0.001 nF	0.5% + 5	0.5% + 5	0.2% + 3	0.5% + 3	0.7% + 10
2000 pF[1]	0.1 pF	0.5% + 10	0.5% + 10	0.5% + 5	0.5% + 3	2.0% + 10
200 pF[1]	0.01 pF	NA	NA	0.5% + 10	0.8% + 10	2.0% + 10
20 pF[1]	0.001 pF	NA	NA	NA	1.0% + 20	2.5% + 10

Notes:
1. The accuracy for ranges 20 pF – 2000 pF is specified after Null function which is used to subtract the stray capacitances of test leads.
2. The accuracy for the ceramic capacitor will be influenced depending on the dielectric constant (K) of the material used to make the ceramic capacitor. For related influence factors, please refer to the Component dependency factors section in the Impedance Measurement Handbook, download able for free at http://www.keysight.com/find/lcrmeters
3. Capacitance is specified to Q > 0.1 and D < 10, otherwise the accuracy is (AZ+Offset) x $\sqrt{(1+D^2)}$

U1731C/U1732C/U1733C Electrical Specifications

Inductance[2]						
				Accuracy = AL + Offset		
Range	Resolution		U1731C/U1732C/U1733C		U1732C/U1733C	U1733C
		100 Hz	120 Hz	1 kHz	10 kHz	100 kHz
20 µH[1]	0.001 µH	NA	NA	NA	1.0% + 5	2.5% + 20
200 µH[1]	0.01 µH	NA	NA	1.0% + 5	0.7% + 3	2.5% + 20
2000 µH[1]	0.1 µH	0.7% + 10	0.7% + 10	0.5% + 3	0.5% + 3	0.8% + 20
20 mH	0.001 mH	0.5% + 3	0.5% + 3	0.2% + 3	0.3% + 3	0.8% + 10
200 mH	0.01 mH	0.5% + 3	0.5% + 3	0.2% + 3	0.2% + 3	1.0% + 10
2000 mH	0.1 mH	0.2% + 3	0.2% + 3	0.2% + 3	0.5% + 5	1.0% + 10
20 H	0.001 H	0.2% + 3	0.2% + 3	0.5% + 5	1.0% + 5	2.0% + 10
200 H	0.01 H	0.7% + 5	0.7% + 5	1.0% + 5	2.0% + 8	NA
2000 H	0.1 H	1.0% + 5	1.0% + 5	2.0% + 8	NA	NA

Notes:
1. The accuracy for ranges 20 uH – 2000 uH is specified after Null function which is used to subtract the inductances of test leads.
2. Inductance is specified to Q > 0.1 and D < 10, otherwise the accuracy is (AL+Offset) x $\sqrt{(1+D^2)}$

Phase Angle of Impedance			
Range	Resolution	Accuracy (θe)	Condition
–180° ~180°	0.1°/1°	(AZ + Offset/Zx) x180/π	D < 1 or Q > 1

Example of calculation shown below is referring to Impedance function with Range of 2000 Ω at frequency of 100 Hz

Impedance	Zx	AZ	Offset	θe
1999.9 Ω	19999	0.2%	3	± 0.12°
199.9 Ω	1999	0.2%	3	± 0.20°
19.9 Ω	199	0.2%	3	± 0.98°
1.9 Ω	19	0.2%	3	± 9.16°

Notes:
1. Specifications are applicable to all models (U1731C, U1732C, and U1733C) unless otherwise specified.
2. The "AZ" and Offset are the accuracy specification for impedance measurement.
3. The "π" is approximately 3.14159.
4. The Zx is the display count of the reading.

Dissipation/Quality Factor			
Function	Range	Accuracy (De)	Condition
Z	0.001~999	AZ + Offset/Zx x 100% + 3	D < 1 or Q > 1
L	0.001~999	AL + Offset/Lx x 100% + 3	D < 1 or Q > 1
C	0.001~999	AC + Offset/Cx x 100% + 3	D < 1 or Q > 1

Example of calculation shown below is referring to Capacitance function with Range of 200 uF at frequency of 100 Hz.

Capacitance	Cx	AC	Offset	De
88.88 µF	8888	0.3%	3	0.334% + 3

Notes:
1. Specifications are applicable to all models (U1731C, U1732C, and U1733C) unless otherwise specified.
2. The "AZ, AL, AC" and Offset are the accuracy specifications for Impedance, Inductance, and Capacitance measurement, respectively.
3. The Zx, Lx, and Cx are the display count of the reading. For example, the Cx is 8888 as if the capacitance is 88.88 µF for the range of 200 µF.
4. The Quality Factor is the reciprocal of Dissipation Factor.

U1731C/U1732C/U1733C Electrical Specifications

Test Signal

		Test signal level		Test frequency	
Model	Selection	Level	Accuracy	Frequency	Accuracy
U1731C/U1732C/U1733C	100 Hz	0.74 Vrms	0.05 Vrms	100 Hz	± 0.01%
	120 Hz	0.74 Vrms	0.05 Vrms	120.481 Hz	± 0.01%
	1 kHz	0.74 Vrms	0.05 Vrms	1 kHz	± 0.01%
U1732C/1733C	10 kHz	0.70 Vrms	0.05 Vrms	10 kHz	± 0.01%
U1733C	100 kHz	0.70 Vrms	0.05 Vrms	100 kHz	± 0.01%
	DCR	+1.235 V	0.05 V	NA	NA

Source Impedance of Impedance/Resistance Measurement

	Typical source impedance					
Range	U1731C/U1732C/U1733C			U1732C/U1733C		U1733C
	100 Hz	120 Hz	1 kHz	10 kHz	100 kHz	DCR
2 Ω	190 Ω	190 Ω	190 Ω	190 Ω	190 Ω	190 Ω
20 Ω	190 Ω	190 Ω	190 Ω	190 Ω	190 Ω	190 Ω
200 Ω	190 Ω	190 Ω	190 Ω	190 Ω	190 Ω	190 Ω
2000 Ω	1.09 kΩ	1.09 kΩ	1.09 kΩ	1.09 kΩ	1.09 kΩ	1.09 kΩ
20 kΩ	10.1 kΩ	10.1 kΩ	10.1 kΩ	10.1 kΩ	1.09 kΩ	10.1 kΩ
200 kΩ	100 kΩ	100 kΩ	100 kΩ	10.1 kΩ	1.09 kΩ	100 kΩ
2000 kΩ	100 kΩ	100 kΩ	100 kΩ	10.1 kΩ	NA	100 kΩ
20 MΩ	100 kΩ	100 kΩ	100 kΩ	100 kΩ	NA	100 kΩ
200 MΩ	100 kΩ	100 kΩ	100 kΩ	NA	NA	100 kΩ

Source Impedance of Capacitance Measurement

	Typical source impedance				
Range	U1731C/U1732C/U1733C			U1732C/U1733C	U1733C
	100 Hz	120 Hz	1 kHz	10 kHz	100 kHz
20 mF	190 Ω	190 Ω	NA	NA	NA
2000 µF	190 Ω	190 Ω	190 Ω	NA	NA
200 µF	190 Ω	190 Ω	190 Ω	190 Ω	NA
20 µF	190 Ω	190 Ω	190 Ω	190 Ω	190 Ω
2000 nF	1.09 kΩ	1.09 kΩ	190 Ω	190 Ω	190 Ω
200 nF	10.1 kΩ	10.1 kΩ	1.09 kΩ	190 Ω	190 Ω
20 nF	100 kΩ	100 kΩ	10.1 kΩ	1.09 kΩ	190 Ω
2000 pF	100 kΩ	100 kΩ	100 kΩ	10.1 kΩ	1.09 kΩ
200 pF	NA	NA	100 kΩ	10.1 kΩ	1.09 kΩ
20 pF	NA	NA	NA	100 kΩ	1.09 kΩ

U1731C/U1732C/U1733C Electrical Specifications

Source Impedance of Inductance Measurement

	Typical source impedance				
Range	U1731C/U1732C/U1733C			U1732C/U1733C	U1733C
	100 Hz	120 Hz	1 kHz	10 kHz	190 kHz
20 µH	NA	NA	NA	190 Ω	100 Ω
200 µH	NA	NA	190 Ω	190 Ω	190 Ω
2000 µH	190 Ω	190 Ω	190 Ω	190 Ω	190 Ω
20 mH	190 Ω	190 Ω	190 Ω	190 Ω	190 Ω
200 mH	190 Ω	190 Ω	190 Ω	1.09 kΩ	1.09 kΩ
2000 mH	190 Ω	190 Ω	1.09 kΩ	10.1 kΩ	1.09 kΩ
20 H	1.09 kΩ	1.09 kΩ	10.1 kΩ	10.1 kΩ	1.09 kΩ
200 H	10.1 kΩ	10.1 kΩ	100 kΩ	100 kΩ	NA
2000 H	100 kΩ	100 kΩ	100 kΩ	NA	NA

General Specifications

Parameter	U1731C	U1732C	U1733C
Measurements	Z/L/C/R/D/Q/θ/ESR	Z/L/C/R/D/Q/θ/ESR	Z/L/C/R/D/Q/θ/ESR/DCR
Display	Primary display: Maximum display 19,999 counts Secondary display: Maximum display 999 counts Automatic polarity indication		
Test frequency (Accuracy = ± 0.1% of actual test frequency)	100 Hz, 120 Hz, 1 kHz	100 Hz, 120 Hz, 1 kHz, 10 kHz	100 Hz, 120 Hz, 1 kHz, 10 kHz, 100 kHz
Backlight	No	Yes	Yes
Test signal level	Selection	Test signal level	Test frequency
	100 Hz	0.74 Vrms	100 Hz
	120 Hz	0.74 Vrms	120.481 Hz
	1 kHz	0.74 Vrms	1 kHz
	10 kHz[1]	0.74 Vrms	10 kHz
	100 kHz[2]	0.74 Vrms	100 kHz
	DCR2	+1.235 V	NA
Tolerance mode	1%, 5%, 10%, 20%		
Ranging mode	Auto and manual		
Measurement rate	1 time/second, nominal		
Response time	Approximately 1 second/DUT (Device Under Test)		
Auto power-off	~0-99 mins without operation		
Power supply	Single standard 9 V battery (alkaline or carbon-zinc) or optional power adaptor		
Power consumption	225 mVA maximum without backlight		
Input protection fuse	Resettable over-current protection		
Battery life	16 hours based on alkaline battery		
Low battery indicator	[▭] will appear when voltage drops below ~7.2 V		
Operating temperature	–10 to 55 °C		
Storage temperature	–20 to 70 °C, 0 to 80% R.H. without battery		
Temperature coefficient	0.1 × (specified accuracy)/°C (from –10 to 18 °C or 28 to 55 °C)		
Relative humidity	Maximum 80% R.H. for temperature up to 30 °C decreasing linearly to 50% R.H. at 55 °C		
Weight	337 grams with battery		
Dimensions (H x W x D)	184 mm x 87 mm x 41 mm		
Safety and EMC Compliance	In compliance with EN61010-1 (IEC61010-1:2001) for low voltage directive and Pollution Degree II Environment. Susceptibility and Emissions (EMC): Commercial Limits per EN61326-1		
Calibration	One-year calibration cycle recommended		
Warranty	3 years for main unit 3 months for standard shipped accessories		

Notes:
1. Only applicable for U1732C/ U1733C
2. Only applicable for U1733C

Ordering Information



Standard Shipped Items	
Standard U1731C, U1732C, and U1733C ordering include:	– Quick Start Guide – Certificate of Calibration (CoC) – Alligator clip leads – 9 V alkaline battery

Recommended Accessories		
U1731P		Combo Kit Includes one U1731C Series handheld and four accessories: – U5491A soft carrying case – U5481B IR-to-USB cable – U1780A AC adaptor – U1782B SMD tweezer
U1732P		Combo Kit Includes one U1732C Series handheld and four accessories: – U5491A soft carrying case – U5481B IR-to-USB cable – U1780A AC adaptor – U1782B SMD tweezer
U1733P		Combo Kit Includes one U1733C Series handheld and four accessories: – U5491A soft carrying case – U5481B IR-to-USB cable – U1780A AC adaptor – U1782B SMD tweezer

Ordering Information (continued)

Recommended Accessories		
U1174A		Soft carrying case
U5481B		IR-to-USB cable
U1782B		SMB tweezer
U1780A		Power adaptor and cord (according to country)
U1781A		Alligator clip leads

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

KEYSIGHT TECHNOLOGIES

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