R & S® ESSENTIALS

R&S®LCX LCR METER

The top-class in component testing

Data Sheet
Version 02.01

ROHDE&SCHWARZ
Make ideas real

AT A GLANCE

The R&S®LCX LCR meters are versatile, extremely accurate and perform measurements quickly. They are ideal for challenging applications in research, development and production. Two instrument models and various options cover applications with a test signal frequency of up to 10 MHz. Internal and external bias functions, comprehensive analysis options and versatile test fixtures expand the wide range of possible applications.

The R&S®LCX100 LCR meter covers the frequency range from 4 Hz to 300 kHz. The R&S®LCX200 has an upper frequency limit of 500 kHz and can be extended to 1 MHz or 10 MHz using software options when needed. All instruments offer DC measurements as well. Internally generated voltages of up to 10 V cover most applications. Optionally, bias voltages of up to 40 V can be applied externally.

A fast logging function records all measured values up to 10 times per second.

Dynamic impedance measurements can be performed using the advanced analysis function. In these sweep measurements, the impedance values are determined for a series of frequency values or other parameters.

Measurements can be triggered and controlled externally via digital I/O ports. The binning function enables the measured components to be sorted by their values into up to eight categories.

The large capacitive touchscreen is the central element for modern and intuitive operation of the instruments and enables the graphical display of the measurement results.

Remote controllability and rack installation predestine the R&S®LCX for system applications.

Key facts

Features	R&S®LCX100	R&S®LCX200
Test signal frequency	DC, 4 Hz to 300 kHz	DC, 4 Hz to 10 MHz (option)
Test signal voltage	10 mV to 10 V	≤ 1 MHz: 10 mV to 10 V, ≤ 5 MHz: 50 mV to 2 V, > 5 MHz: 100 mV to 1 V
DC bias voltage (internal)	0 V to +10 V	
DC bias current (internal)	0 mA to 200 mA	
External DC bias voltage, input	0 V to +40 V	
Source impedance	100 Ω, 10 Ω	
Measurement range	10 mΩ to 100 MΩ	
Basic accuracy for impedance measurements	0.05 %	

BENEFITS AND KEY FEATURES

Universal LCR meter

- Fast, accurate and versatile
- Selectable frequency range
- Test signals for all requirements
- DC bias
- Measurement functions
- Data logging function

Options for advanced applications

- R&S®LCX-K106 advanced analysis functions
- R&S®LCX-K107 digital I/O ports and binning function
- R&S®LCX-K108 extended bias functions
- R&S®LCX-K201/-K210 frequency upgrade to 1 MHz/10 MHz

Easy operation

- High-resolution touchscreen
- Graphical representation of measurements
- Save and recall instrument settings

Test fixtures

- R&S®LCX-Z1 test fixture for axial/radial lead type devices
- R&S®LCX-Z2 Kelvin clip lead
- R&S®LCX-Z3 test fixture for SMD components
- R&S®LCX-Z4 test tweezers for SMD components
- R&S®LCX-Z5 transformer test cables
- R&S®LCX-Z11 BNC extension

Ideal for use in labs and test systems

- Tailored for use in labs and system racks
- Full remote capabilities
- Advanced instrument design: compact form factor, quiet operation

UNIVERSAL LCR METER

Fast, accurate and versatile

Both R&S®LCX models combine high measurement speed, accuracy and versatile measurement capabilities. This makes them the ideal instruments for standard measurements in development, for material analysis in research as well as for fast production testing. With their broad measurement ranges, they also cover applications with extremely low and extremely high impedances.

Three measurement times are available:

- Fast: ≤ 15 ms
- Medium: ≤ 100 ms
- Slow: ≤ 500 ms

The basic accuracy for impedance measurements is ±0.05%, and for phase measurements ±0.03°.

Selectable frequency range

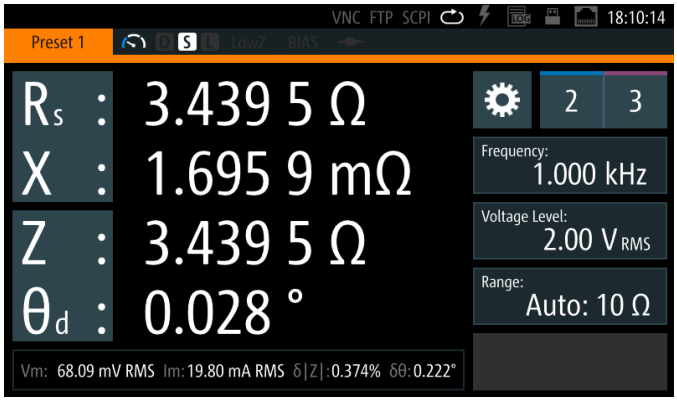
All R&S®LCX models measure under DC conditions. The AC range already begins at 4 Hz. The upper frequency limit on the R&S®LCX100 is 300 kHz. In its base configuration, the R&S®LCX200 is designed for a maximum frequency of 500 kHz; this frequency limit can, however, be extended to 1 MHz or 10 MHz. This means that the ideal instrument is available for any given application and budget.

Test signals for all requirements

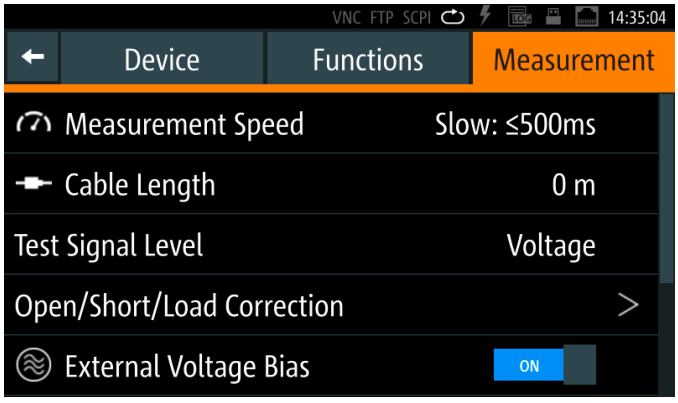
Test signals can be generated from 10 mV to 10 V and deliver a current of up to 200 mA. The instruments have a selectable output impedance of 100 Ω or 10 Ω. The actual current flow and the voltage applied are measured using the monitor function.

DC bias

In many applications, an adjustable DC bias is necessary in order to measure C and L components at different operating points. The R&S®LCX100 and R&S®LCX200 generate a DC bias voltage of up to 10 V. As an option, it is also possible to set a DC bias current (up to 200 mA). DC bias voltages of up to 40 V can be applied at an external connection on the rear panel (R&S®LCX-K108 option) using a standard DC power supply, for example an R&S®NGA.



Up to four measurement parameters can be shown on the display at the same time



Test signals and measurement functions can be configured as required

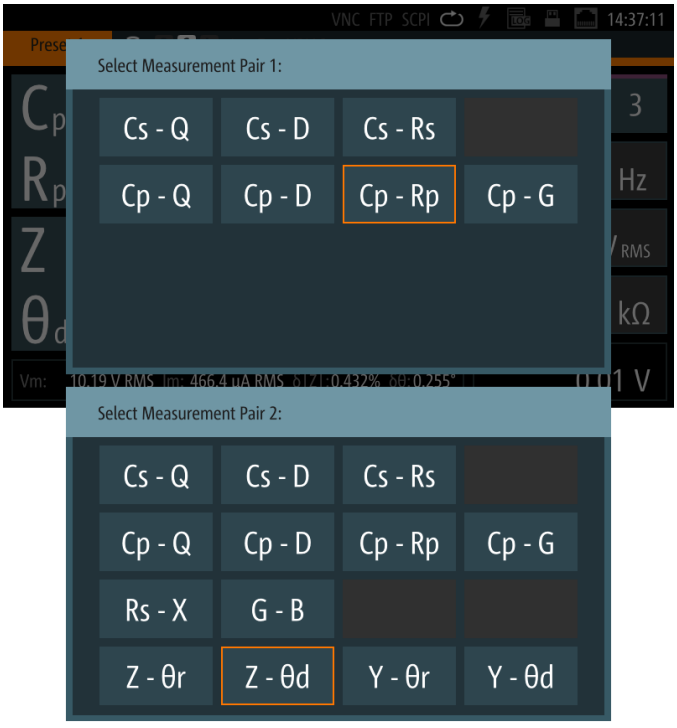
Measurement functions

In addition to the many different impedance measurements, the two R&S®LCX LCR meters are also able to measure resistances with DC voltage as well as transformers. The display can show up to four measurement parameters at the same time, and the measurement functions can be selected in pairs from the following table:

Data logging function

The R&S®LCX LCR meters provide a fast logging function for recording all measured values. The data can be saved on an external USB flash drive or transferred to an external PC via USB or LAN. With a data rate of up to 10 sample/s, the measured values are available every 100 ms.

List of measurement functions	
Cp	Capacitance value measured with parallel-equivalent circuit model
Cs	Capacitance value measured with series-equivalent circuit model
Lp	Inductance value measured with parallel-equivalent circuit model
Ls	Inductance value measured with series-equivalent circuit model
D	Dissipation factor
Q	Quality factor (inverse of D)
G	Equivalent parallel conductance measured with parallel-equivalent circuit model
Rp	Equivalent parallel resistance measured with parallel-equivalent circuit model
Rs	Equivalent series resistance measured with series-equivalent circuit model
Rdc	Direct current resistance
R	Resistance
X	Reactance
Z	Impedance
Y	Admittance
Θd	Phase angle of impedance/admittance (degree)
Θr	Phase angle of impedance/admittance (radian)
B	Susceptance
M	Mutual inductance
N	Turns ratio



Measurement functions can be selected in pairs

OPTIONS FOR ADVANCED APPLICATIONS

R&S®LCX-K106 advanced analysis functions

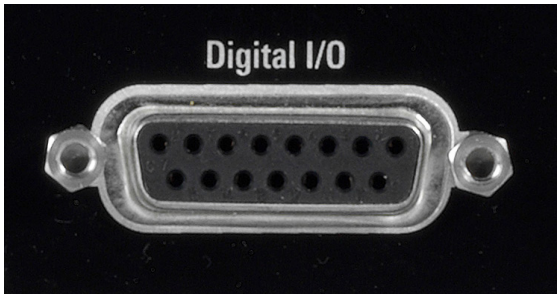
In most cases, an LCR meter is used for measuring impedance values. However, depending on the type of component, these values vary to a greater or lesser degree at different frequencies and levels.

The R&S®LCX-K106 option, which is activated using a keycode (to be ordered separately), can be used for dynamic impedance measurements. In these sweep measurements, the impedance values are determined for a series of frequency values. The voltage or current values of the test signals or of the bias signal can also be used as sweep parameters. The results are shown in tables and graphically.

R&S®LCX-K107 digital I/O ports and binning function

A further option for the R&S®LCX100/LCX200 instruments is a set of digital I/O ports. This includes a trigger input (implemented as a BNC connector) and eight data lines for binning. With this function, the measurement results can be divided into up to eight tolerance ranges and the measured components sorted by their values (controlled via these digital lines) into sorting containers installed by the customer.

The hardware of the R&S®LCX-K107 option is already installed; the function is activated using a keycode.



Digital I/O ports on rear panel

R&S®LCX-K108 extended bias functions

As standard, the R&S®LCX100 and R&S®LCX200 generate internal DC bias voltages of up to 10 V. This already allows a wide variety of measurements to be performed. The R&S®LCX-K108 option extends the range of applications. On the one hand, this provides a larger voltage range when using the external bias ports on the rear of the LCR meters. Voltages of up to 40 V, e.g. from an external power supply unit, can be applied at the two 4 mm safety sockets. In this case, the current is protected by means of an externally accessible 0.5 A fine-wire fuse.

On the other hand, this option allows the internal bias source to be operated in current regulation mode with an adjustable current of up to 200 mA.

As with the previously mentioned option, the hardware of the R&S®LCX-K108 option is also already installed. It can be activated using a keycode (to be ordered separately).

Ports for external bias voltages on rear panel

R&S®LCX-K201/-K210 frequency upgrade to 1 MHz/10 MHz

The R&S®LCX200 LCR meter has more powerful analysis hardware than the R&S®LCX100. In addition to DC, the R&S®LCX200 base unit offers a frequency bandwidth of 4 Hz to 500 kHz. Depending on the measurement requirements, the R&S®LCX-K201 option can be added on the instrument at any time to extend the bandwidth to 1 MHz. Alternatively, the R&S®LCX-K210 option is available to extend the bandwidth to 10 MHz.

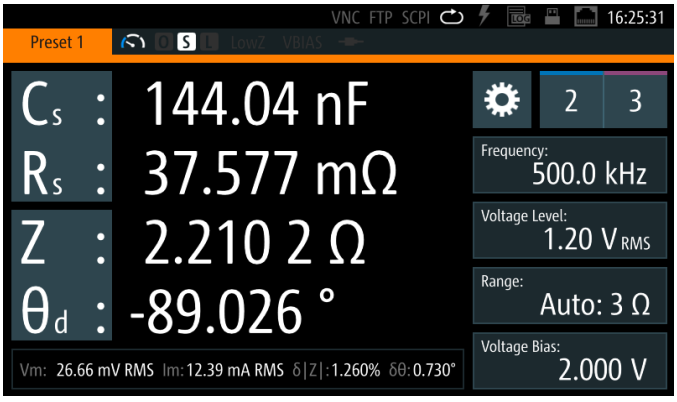
Both options are keycodes, which can be installed on the R&S®LCX200 at any time; no hardware modification or additional calibration is required.

EASY OPERATION

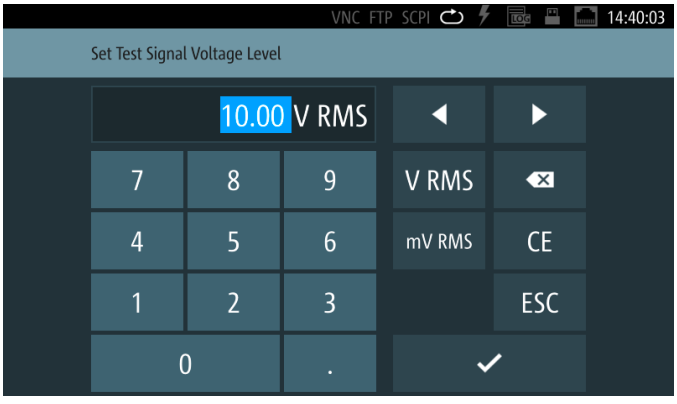
High-resolution touchscreen

The large capacitive touchscreen is the central operating element of the R&S®LCX LCR meters. A virtual keyboard for entering the desired value is displayed by lightly tapping on a numerical value. Alternatively, the voltage, current and frequency can be set using the rotary knob. Functions that are less frequently used can be accessed and operated via menus.

With a very high resolution, the display sets new standards for LCR meters. The large, high-contrast display makes it easy to read all measured values, even from a distance. A wide variety of additional information, such as settings or statistics, can also be displayed. Icons clearly show the status of the set special functions.



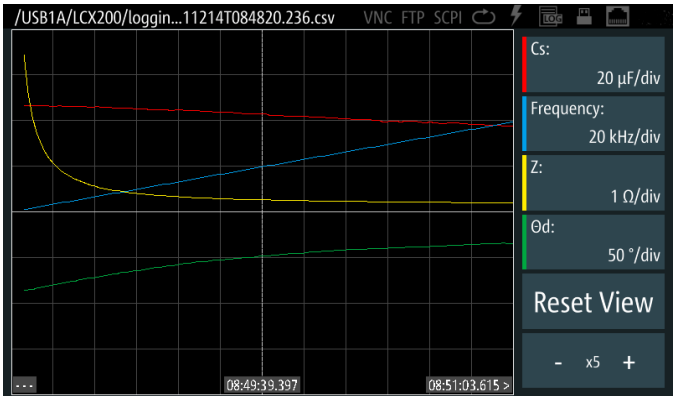
The measured values are displayed with up to 5-digit resolution. Up to four measured values can be displayed at a time.



Virtual keypad for entering numerical values

Graphical representation of measurements

The large display can also be used for graphics. Up to four measurement functions can be selected and plotted versus time, and minimum and maximum values can be marked additionally.



The high-resolution display can also be used for graphical presentations. This example shows traces for impedance measurements of a capacitor.

Save and recall instrument settings

The save and recall functions make it easy to save and recall frequently used settings. Three instrument settings can be accessed directly on the touchscreen. Other settings can be stored freely.

Three instrument settings can be called directly on the touchscreen

TEST FIXTURES

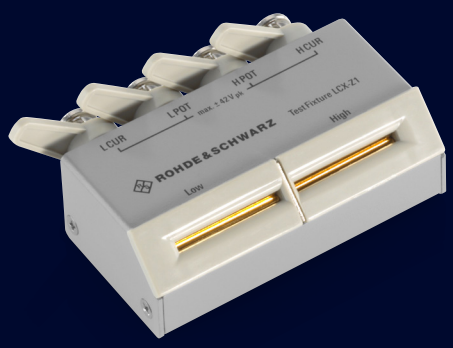
LCR meters from Rohde & Schwarz can perform measurements on a wide range of components. Test fixtures are available that match the shape of the component.

The auto-balancing bridge (Kelvin bridge) measurement method requires the respective test lead pair to be routed up to the component to be measured (four-terminal measurement). This is ensured by all test fixtures, which makes them essential for accurate measurements and for minimizing parasitic impedances.

The fixtures are easily connected to the base unit by means of locking levers.

R&S®LCX-Z1 test fixture for axial/radial lead type devices

This test fixture has two spring-loaded insertion slots into which axial/radial lead type devices can be inserted. A shorting plate is included for short-circuit correction.

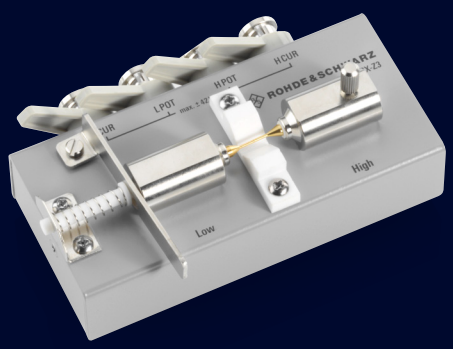


R&S®LCX-Z2 Kelvin clip lead

The Kelvin clips of the R&S®LCX-Z2 are used for connecting components which, e.g. due to their size, cannot be tested using conventional test fixtures. The two clip parts of each Kelvin clip are isolated from each other and therefore connected separately to the CUR and POT lines. This ensures that the two test leads are only connected directly at the DUT.

R&S®LCX-Z3 test fixture for SMD components

The R&S®LCX-Z3 SMD test fixture is ideal for the qualification of SMD components. The terminal contact ends of the SMD component to be measured are clamped between the two contact pins (measuring contacts) provided.



R&S®LCX-Z4 test tweezers for SMD components

Similar to the Kelvin clips mentioned above, the test tweezers can be used for contacting SMD components that cannot be placed in the SMD test fixture.

R&S®LCX-Z5 transformer test cables

This test fixture is designed for measuring transformers and transducers in combination with the transformer measurement functions of the R&S®LCX LCR meters. It is a convenient tool for measuring the mutual inductance (M), turns ratio (N) and phase angle (Θ) of a transformer in the frequency range up to 100 kHz. To perform the measurement, the primary and secondary windings of the transformer to be measured are connected to the test leads according to the circuit diagram printed on the test fixture.

R&S®LCX-Z11 BNC extension

This 1 m long extension allows the test fixture to be used at a distance from the measuring instrument. The effect of the cables is compensated by the base unit.

IDEAL FOR USE IN LABS AND TEST SYSTEMS

Tailored for use in labs and system racks

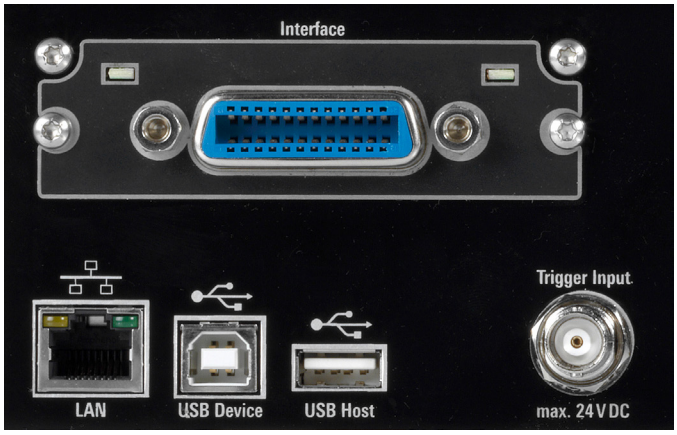
The R&S®LCX LCR meters are the right choice for challenging applications. They are used in R&D labs and integrated into production test systems.

The instruments can be installed in 19" racks using the R&S®ZZA-GE23 rack adapter. The compact design is critical for use in test systems.

Full remote capabilities

For use in test systems, the R&S®LCX LCR meters can be remotely controlled. The following interfaces are available:

- USB and LAN (Ethernet) interfaces are installed as standard. All instrument parameters can be remotely controlled via these interfaces.
- IEEE-488 (GPIB) interface (R&S®NG-B105 option): The R&S®NG-B105 interface with IEEE-488 (GPIB) port can also be retrofitted by the user.



All remote control interfaces are available on the rear panel of the instrument (example: R&S®LCX200 with installed IEEE-488 option)

Advanced instrument design: compact form factor, quiet operation

There is never enough space on the bench or in the rack. The R&S®LCX LCR meters take up very little space thanks to their compact design.

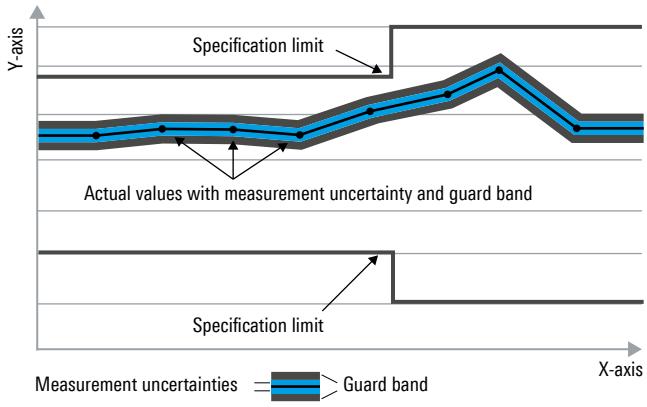
Since the built-in fan is temperature-controlled, it often runs at a low speed, resulting in extremely low operating noise.

SPECIFICATIONS

Definitions

General
Product data applies under the following conditions:
- ▶ Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- ▶ All data is valid at +23 °C (–3 °C/+7 °C) after 30 minutes warm-up time
- ▶ Specified environmental conditions met
- ▶ Recommended calibration interval adhered to
- ▶ All internal automatic adjustments performed, if applicable

Specifications with limits
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design.
Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (for example, dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter (for example, nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: "parameter: value".

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bit per second (Gbps), million bit per second (Mbps), thousand bit per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

All data is valid at +23 °C (– 3 °C/+ 7 °C) after 60 minutes warm-up time. All voltage/current data are RMS values unless otherwise specified.

Test signals		
Test signal frequency		
Frequency range	R&S®LCX100	DC, 4 Hz to 300 kHz
	R&S®LCX200	DC, 4 Hz to 500 kHz
	R&S®LCX200 with R&S®LCX-K201 option	DC, 4 Hz to 1 MHz
	R&S®LCX200 with R&S®LCX-K210 option	DC, 4 Hz to 1 MHz (at 10 Ω), DC, 4 Hz to 10 MHz (at 100 Ω)
Frequency resolution		4 Hz to < 1 kHz: 0.1 Hz, 1 kHz to < 10 kHz: 1 Hz, 10 kHz to < 100 kHz: 10 Hz, 100 kHz to < 1 MHz: 100 Hz, 1 MHz to 10 MHz: 1 kHz
Frequency accuracy		±100 ppm
Test signal modes		
Modes		open voltage (V), short current (C), DC resistance (Rdc)
Test signal impedance		
Source impedance		100 Ω, 10 Ω
Source impedance accuracy	±(% of setting + offset)	< 2 % + 200 mΩ (nom.)
Test signal level	Specifications are valid for impedance measurements (AC measurements) as well as for Rdc measurements. [1]	
Test signal voltage (at 100 Ω)	without load	
Voltage range		≤ 1 MHz: 10 mV to 10 V [2], ≤ 5 MHz: 50 mV to 2 V, > 5 MHz: 100 mV to 1 V
Voltage resolution		≤ 2 V: 1 mV, > 2 V: 10 mV
Voltage setting accuracy in mode V	±(% of setting + offset)	≤ 1 MHz: < 5 % + 2.5 mV, > 1 MHz: < 10 % + 5 mV, > 5 MHz: < 15 % + 10 mV
Test signal voltage (at 10 Ω)	without load	
Voltage range		≤ 100 kHz: 10 mV to 2 V, > 100 kHz to ≤ 1 MHz: 10 mV to 1 V
Voltage resolution		1 mV
Voltage setting accuracy in mode V	±(% of setting + offset)	< 5 % + 2.5 mV (meas.)
Test signal current (at 100 Ω)		
Current range		≤ 1 MHz: 0.1 mA to 100 mA, ≤ 5 MHz: 0.5 mA to 20 mA, > 5 MHz: 1 mA to 10 mA
Current resolution		≤ 20 mA: 10 µA, > 20 mA: 100 µA
Current setting accuracy in mode C	±(% of setting + offset)	≤ 1 MHz: < 5 % + 25 µA (meas.), > 1 MHz: < 10 % + 50 µA (meas.)
Test signal current (at 10 Ω)		
Current range		≤ 100 kHz: 1 mA to 200 mA, > 100 kHz to ≤ 1 MHz: 1 mA to 100 mA
Current resolution		100 µA
Current setting accuracy in mode C	±(% of setting + offset)	< 5 % + 25 µA (meas.)
Test signal monitor	AC component	voltage, current
Voltage monitor accuracy	±(% of measured value + offset)	≤ 1 MHz: ≤ 2.5 % + 5 mV
Current monitor accuracy	±(% of measured value + offset)	≤ 1 MHz: ≤ 2.5 % + 50 µA

[1] All test signal specifications for voltages < 100 mV and for currents < 1 mA are only valid for R&S®LCX100 LCR meters with the firmware release 02.036 and for R&S®LCX200 LCR meters with serial numbers ≥ 102000.

[2] If a 1 m long test cable is used, the maximum test voltage is reduced to 9.5 V.

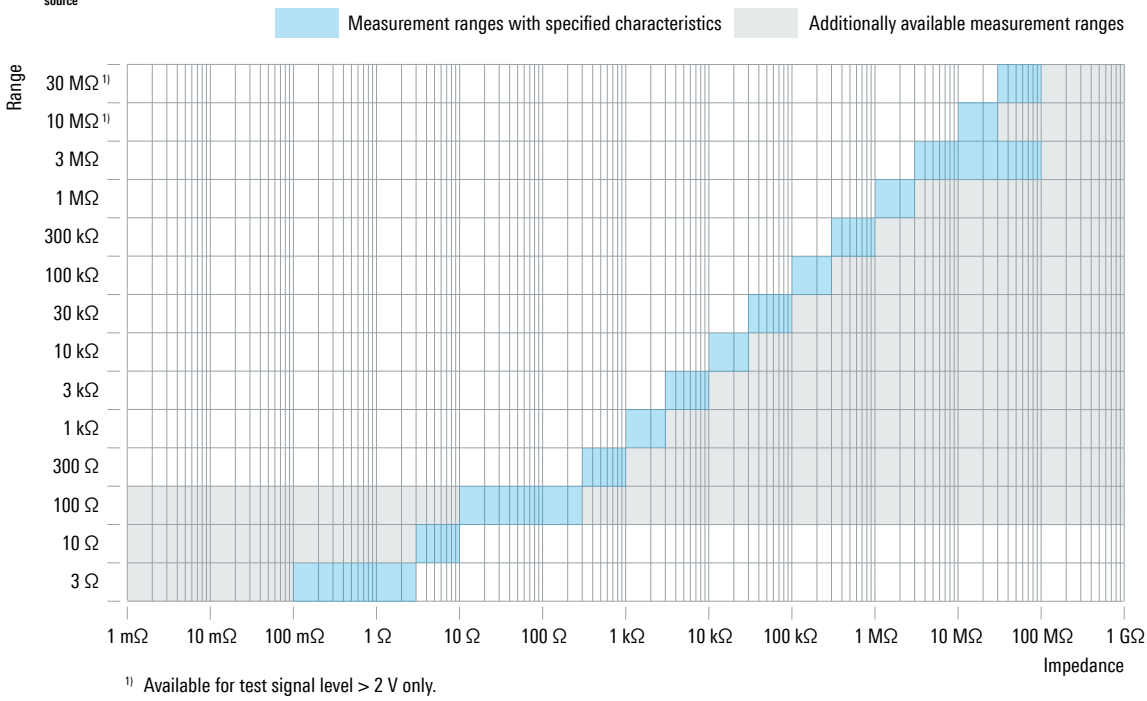
DC bias signals		
Internal bias voltage		
Voltage range[3]	at 100 Ω source impedance	0 V to 10 V (DC)
	at 10 Ω source impedance	0 V to 2 V (DC)
Voltage resolution		10 mV
Voltage setting accuracy	±(% of setting + offset)	test signal < 5 V: < (1 % + 4 mV) × K_t test signal ≥ 5 V: < (1 % + 12 mV) × K_t
K_t (temperature coefficient)	+23 °C (–3 °C/+7 °C)	1
	other temperatures	1 + 0.1 × abs(T_a – 23)
Internal bias current	R&S®LCX-K108 required	
Current range		0 mA to 200 mA (DC)
Current resolution		1 mA
Current setting accuracy	±(% of setting + offset)	< 1 % + 1 mA
Maximum DC resistance of DUT	at 100 Ω source impedance	50 Ω
	at 10 Ω source impedance	5 Ω
External bias voltage[4]	R&S®LCX-K108 required	
Voltage range		0 V to +40 V (DC)
Voltage monitor resolution		11 mV
Measurement accuracy	±(% of measured value + offset)	< 2.5 % + 44 mV

Measurements		
Measurement functions		L, C, R, Z, X, Y, G, B, D, Q, Θ, M, N, Rdc
Impedance measurement range	at 100 Ω source impedance	100 mΩ to 100 MΩ
	at 10 Ω source impedance	10 mΩ to 100 Ω
Phase measurement range		–180° to +180°
Range selection		auto, manually
Cable length		0 m, 1 m
Maximum test cable length		1 m
Measurement time	test frequency ≥ 1 kHz	fast: ≤ 15 ms, medium: ≤ 100 ms, slow: ≤ 500 ms
Compensation function		open, short, load
Open limits		≤ 5 MHz: min. 100 kΩ, > 5 MHz: min. 10 kΩ
Short limits		≤ 5 MHz: max. 3 Ω, > 5 MHz: max. 10 Ω

[3] The combined output voltage (internal voltage bias plus the test signal voltage) is limited to 15 V (peak).
[4] When using external voltage bias, the test signal level is limited to 2 V.

Effective measurement ranges

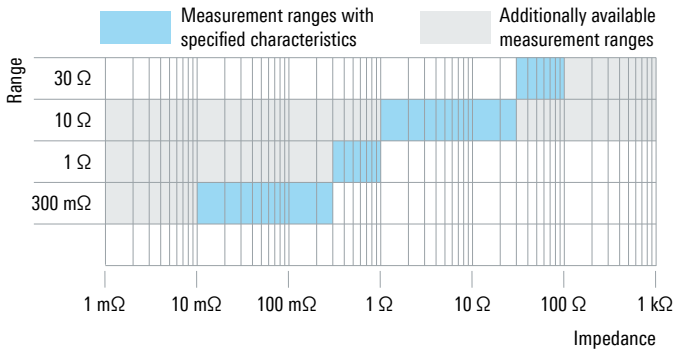
For R_{source} = 100 Ω



1) Available for test signal level > 2 V only.

Specified measurement ranges for R_{source} = 100 Ω	► 3 Ω range: 0.1 Ω to 3 Ω ► 10 Ω range: 3 Ω to 10 Ω ► 100 Ω range: 10 Ω to 300 Ω ► 300 Ω range: 300 Ω to 1 kΩ ► 1 kΩ range: 1 kΩ to 3 kΩ ► 3 kΩ range: 3 kΩ to 10 kΩ ► 10 kΩ range: 10 kΩ to 30 kΩ ► 30 kΩ range: 30 kΩ to 100 kΩ ► 100 kΩ range: 100 kΩ to 300 kΩ ► 300 kΩ range: 300 kΩ to 1 MΩ ► 1 MΩ range: 1 MΩ to 3 MΩ ► 3 MΩ range: 3 MΩ to 100 MΩ ► 10 MΩ (> 2 V only): 10 MΩ to 30 MΩ ► 30 MΩ range (> 2 V only): 30 MΩ to 100 MΩ

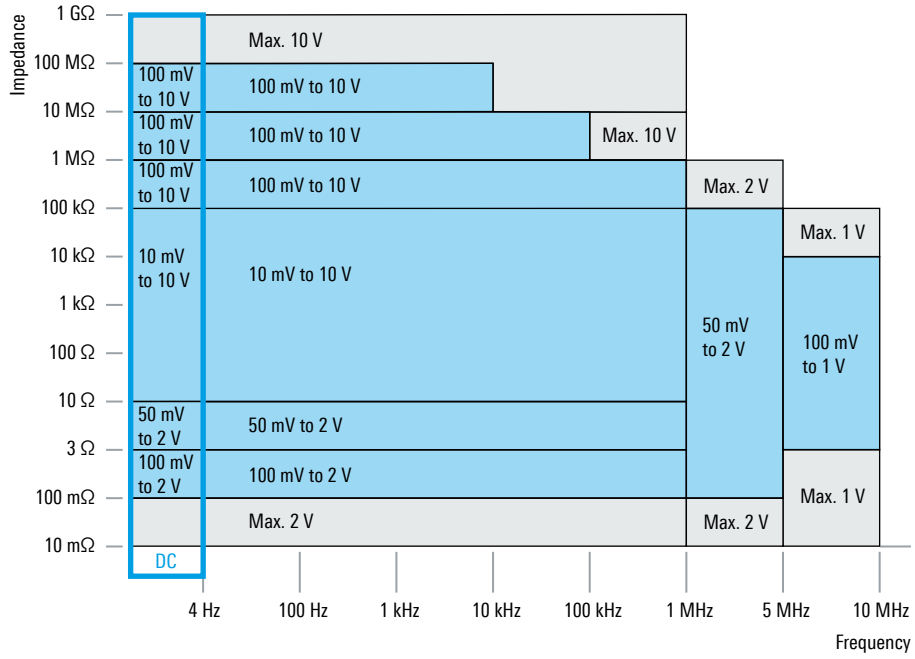
For R_{source} = 10 Ω (low Z mode)



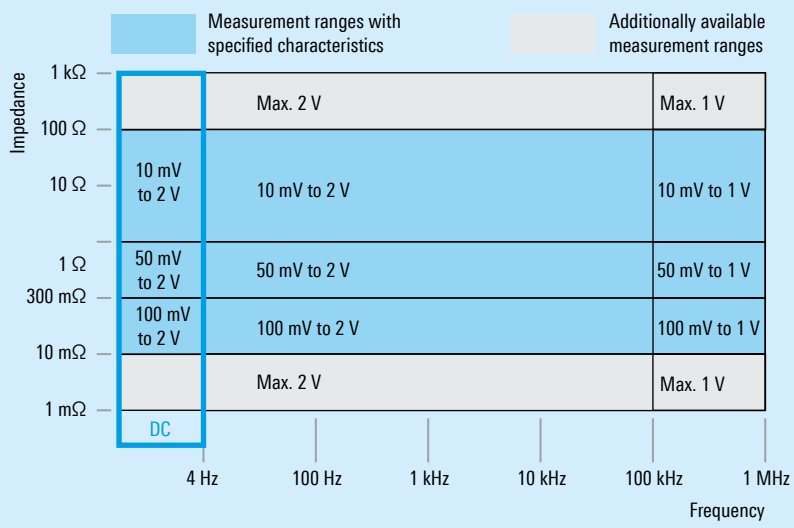
Specified measurement ranges for R_{source} = 10 Ω	► 0.3 Ω range: 0.01 Ω to 0.3 Ω ► 1 Ω range: 0.3 Ω to 1 Ω ► 10 Ω range: 1 Ω to 30 Ω ► 30 Ω range: 30 Ω to 100 Ω

Effective measurement ranges

For R_{source} = 100 Ω



For R_{source} = 10 Ω (low Z mode)



[1] All test signal specifications for voltages < 100 mV and for currents < 1 mA are only valid for R&S®LCX100 LCR meters with the firmware release 02.036 and for R&S®LCX200 LCR meters with serial numbers ≥ 102000.

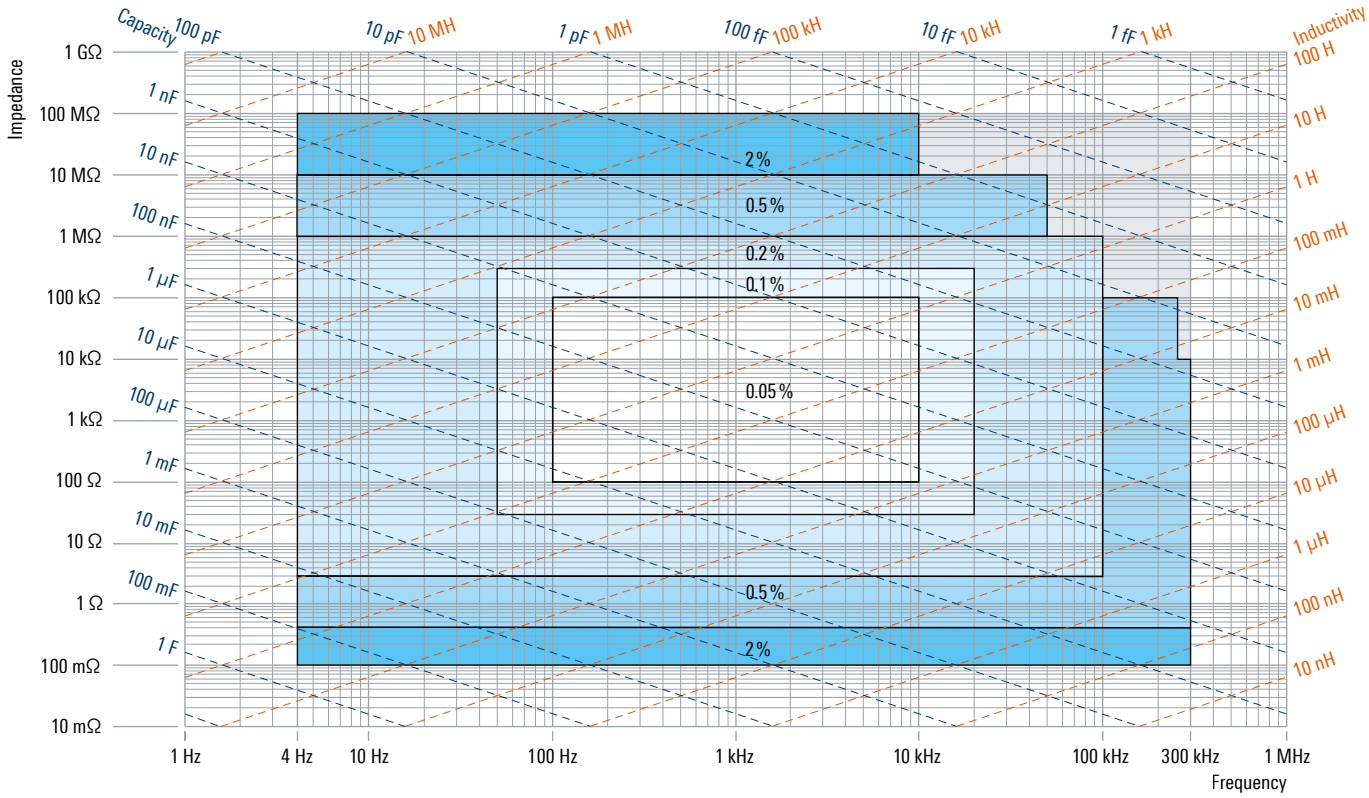
Measurement accuracy

The measurement accuracy is determined according to the following rule:

Impedance (Z) measurement accuracy:
Impedance measurement accuracy in % = basic accuracy × K_{sl} × K_{ms} × K_{cl} × K_b × K_t × K_f
Absolute impedance accuracy in % = impedance measurement accuracy in % + impedance calibration accuracy in %

Phase (Phi) measurement accuracy:
Phase measurement accuracy in deg (°) = (180/π) × impedance (measurement accuracy in %/100)
The minimum measurement accuracy is 0.03°.
Absolute phase accuracy in deg (°) = phase measurement accuracy in ° + phase calibration accuracy in °

Basic accuracy (BA) of R&S®LCX100 for R_{source} = 100 Ω
BA in % = accuracy in % + (Z_m/Z_o × 100) + (Z_s/Z_m × 100)
Z_m is the measured impedance; Z_o and Z_s are given in the table below



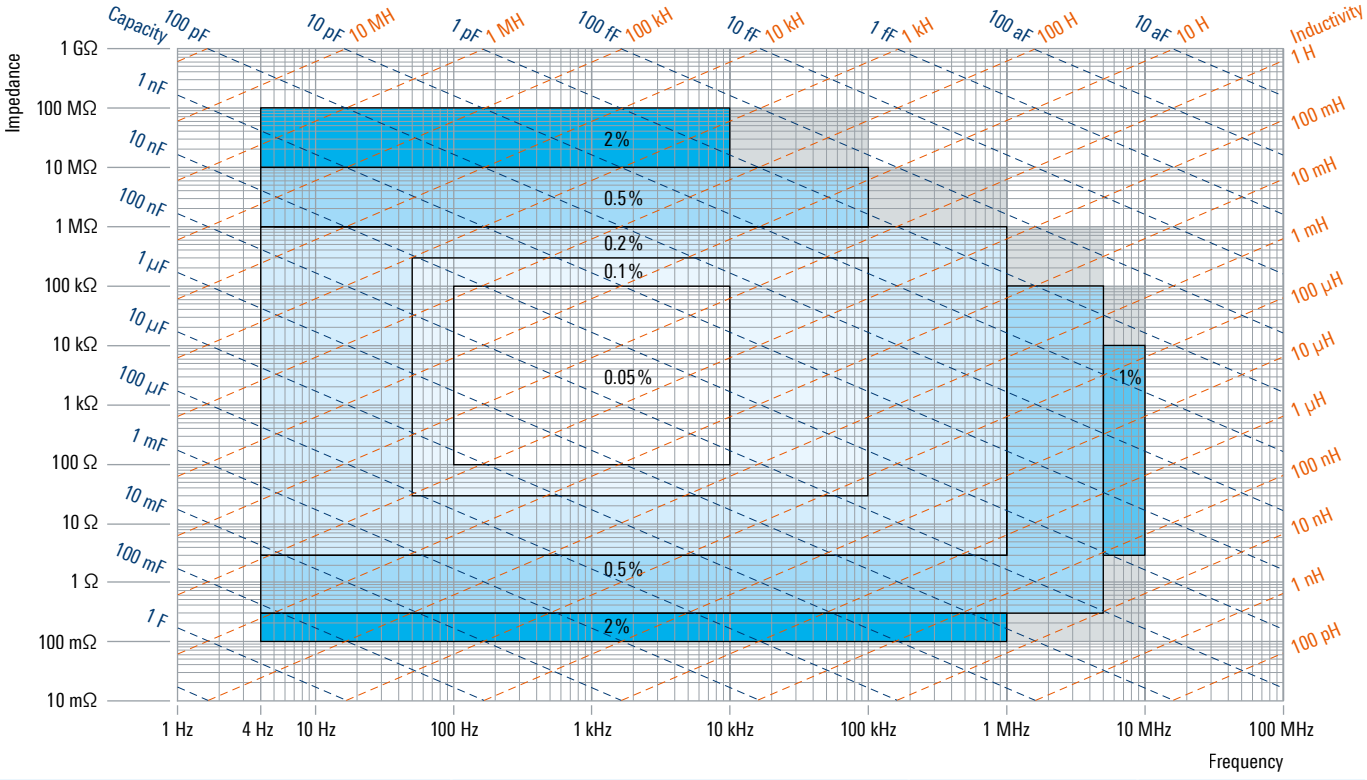
Impedance open/short	Test signal frequency	Z_o	Z_s
	≤ 1 kHz	2 GΩ	1 mΩ
	1 kHz to ≤ 10 kHz	1 GΩ	1 mΩ
	10 kHz to ≤ 100 kHz	250 MΩ	1.5 mΩ
	100 kHz to ≤ 300 kHz	100 MΩ	2.5 mΩ

Measurement accuracy

Basic accuracy (BA) of R&S®LCX200 for R_{source} = 100 Ω

BA in % = accuracy in % + (Z_m/Z_o × 100) + (Z_s/Z_m × 100)

Z_m is the measured impedance; Z_o and Z_s are given in the table below



Impedance open/short	Test signal frequency	Z_o	Z_s
	≤ 1 kHz	2 GΩ	1 mΩ
	1 kHz to ≤ 10 kHz	1 GΩ	1 mΩ
	10 kHz to ≤ 100 kHz	250 MΩ	1.5 mΩ
	100 kHz to ≤ 1 MHz	150 MΩ	1.5 mΩ
	1 MHz to ≤ 5 MHz	10 MΩ	10 mΩ
	5 MHz to ≤ 10 MHz	1 MΩ	30 mΩ

In the case of operating points that occur at frequency-dependent limits, the basic accuracy which is valid for frequencies lower than the observed frequency applies.

▷ Example: 1 kΩ at 1 MHz ▷ 0.2% basic accuracy or 1 kΩ at 100 Hz ▷ 0.1% basic accuracy

In the case of operating points that occur at impedance-dependent limits, the basic accuracy which is valid for impedances higher than the observed impedance applies.

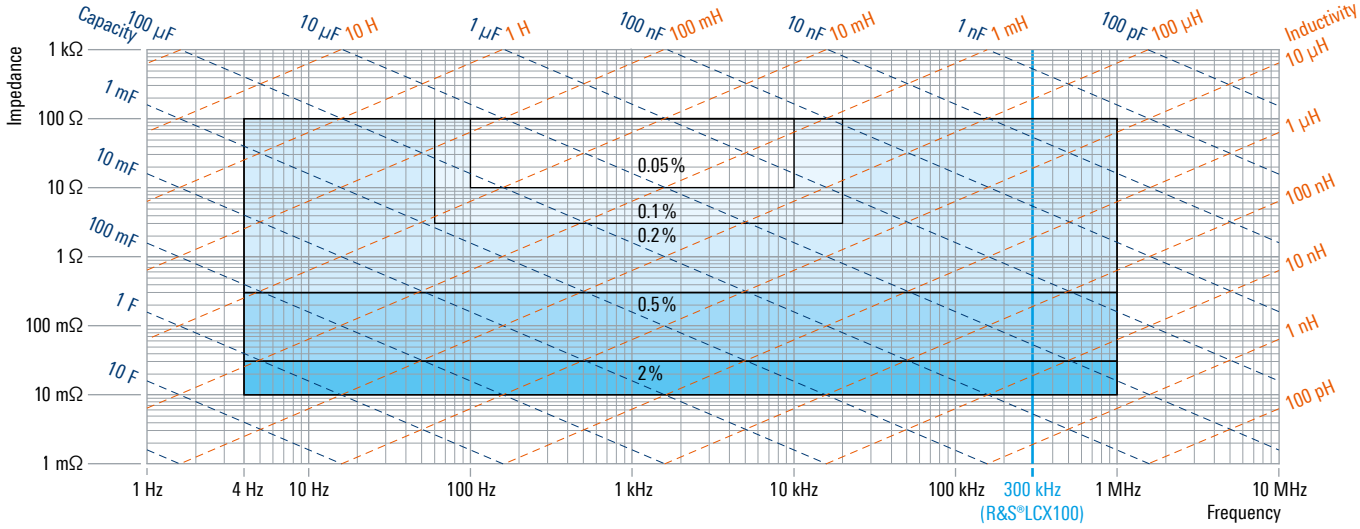
▷ Example: 100 kΩ at 1 kHz ▷ 0.1% basic accuracy or 3 Ω at 1 kHz ▷ 0.2% basic accuracy

Measurement accuracy

Basic accuracy (BA) of R&S®LCX100/LCX200 for R_{source} = 10 Ω (low Z mode)

BA in % = accuracy in % + (Z_s/Z_m × 100)

Z_m is the measured impedance; Z_s is given in the table below (low Z mode)



Impedance short	Test signal frequency	Z_s
	≤ 10 kHz	0.5 mΩ
	10 kHz to ≤ 100 kHz	1 mΩ
	100 kHz to ≤ 1 MHz	1.5 mΩ

Measurement accuracy

Basic accuracy (BA) of Rdc measurements for R_{source} = 100 Ω

BA in % = accuracy in % + (Z_m/20 GΩ × 100) + (1 mΩ/Z_m × 100)

Z_m is the measured impedance

Impedance range		**Accuracy**
< 300 mΩ		2.0 %
300 mΩ to < 30 Ω		0.5 %
30 Ω to < 100 Ω		0.2 %
100 Ω to < 100 kΩ		0.1 %
100 kΩ to < 300 kΩ		0.2 %
300 kΩ to < 10 MΩ		0.5 %
10 MΩ to 100 MΩ		2.0 %

Measurement accuracy

K_{sl} (level coefficient)	**Sv**	**K_{sl}**
	0 mV to 200 mV	1 + 0.2/Sv [5]
	> 200 mV to 500 mV	0.5 + 0.5/Sv
	> 500 mV to 1 V	1/Sv
	> 1 V to 2 V	0.5 + 2/Sv
	> 2 V to 5 V	1 + 5/Sv
	> 5 V to 10 V	1 + 10/Sv
K_{ms} (measurement speed coefficient)	fast	8
	medium	3
	slow	1
K_{cl} (cable length coefficient)	0 m	1
	1 m	1.5

[5] Sv: setting value in V.

Measurement accuracy			
K_b (bias coefficient)	**bias setting**		**K_b**
	bias voltage on (internal or external bias voltage)		2
	bias current on		5 (for test frequency < 1 kHz), 2 (for test frequency ≥ 1 kHz)
	bias off		1
K_t (temperature coefficient)	+23 °C (–3 °C/+7 °C)		1
	other temperatures		1 + 0.1 × abs(T_a – 23)
K_f (frequency coefficient)	test signal frequency ≤ 300 kHz		1
	test signal frequency > 300 kHz		(f + 4550)/4850 with f in kHz
Calibration accuracy of R&S®LCX100/LCX200 for R_{source} = 100 Ω and ≤ 2 V			
	Test frequency	Impedance calibration accuracy	Phase calibration accuracy
3 Ω and 10 Ω range	≤ 1 MHz	±0.03 %	±0.025°
	> 1 MHz to ≤ 5 MHz	±0.05 %	±0.025°
	> 5 MHz to 10 MHz	±0.2 %	±0.05°
100 Ω and 300 Ω range	≤ 1 MHz	±0.03 %	±0.025°
	> 1 MHz to ≤ 5 MHz	±0.05 %	±0.025°
	> 5 MHz to 10 MHz	±0.2 %	±0.05°
1 kΩ and 3 kΩ range	≤ 1 MHz	±0.03 %	±0.025°
	> 1 MHz to ≤ 5 MHz	±0.05 %	±0.025°
	> 5 MHz to 10 MHz	±0.2 %	±0.05°
10 kΩ and 30 kΩ range	≤ 1 MHz	±0.03 %	±0.025°
100 kΩ and 300 kΩ range	≤ 1 MHz	±0.03 %	±0.025°
1 MΩ and 30 MΩ range	≤ 100 kHz	±0.05 %	±0.05°
Calibration accuracy of R&S®LCX100/LCX200 for R_{source} = 100 Ω and > 2 V			
	Test frequency	Impedance calibration accuracy	Phase calibration accuracy
3 Ω and 10 Ω range	≤ 1 MHz	±0.03 %	±0.025°
100 Ω and 300 Ω range	≤ 1 MHz	±0.03 %	±0.025°
1 kΩ and 3 kΩ range	≤ 1 MHz	±0.03 %	±0.025°
10 kΩ and 30 kΩ range	≤ 1 MHz	±0.03 %	±0.025°
100 kΩ and 300 kΩ range	≤ 1 MHz	±0.03 %	±0.025°
1 MΩ and 3 MΩ range	≤ 1 MHz	±0.03 %	±0.025°
10 MΩ and 30 MΩ range	≤ 100 kHz	±0.05 %	±0.05°
Calibration accuracy of R&S®LCX100/LCX200 for R_{source} = 10 Ω and ≤ 2 V			
	Test frequency	Impedance calibration accuracy	Phase calibration accuracy
300 mΩ, 1 Ω, 10 Ω and 30 Ω ranges	≤ 1 MHz	±0.03 %	±0.025°
	> 1 MHz to ≤ 5 MHz	±0.1 %	±0.05°

Basic accuracy		
Impedance		±0.05 %
Rdc		±0.1 %
Phase		±0.03°

Special functions		
Transformer measurements	R&S®LCX-Z5 required	
Test signal frequency		4 Hz to 100 kHz
Test signal voltage		10 mV to 2 V
Measurement ranges	turns ratio (N)	0.95 N to 500 N
	phase angle (Θ)	–180° to +180°
	mutual inductance (M)	1 µH to 100 H
Accuracy		N ≤ 10 and 100 Hz ≤ f ≤ 10 kHz: N: ±1% (meas.) Θ: ±0.2° (meas.) (with minimal primary impedance: 100 Ω)
	mutual inductance (M)	N ≤ 20, f ≤ 10 kHz and 300 µH ≤ M ≤ 50 mH: ±0.5% ±1 µH (meas.)
Digital trigger and control interfaces	R&S®LCX-K107 required	
Trigger mode		continuous, manual (hardkey on front), external via remote control, external via digital I/O interface
Trigger delay time		0 s to 60 s (100 ms increments)
Digital trigger		
Maximum digital voltage	BNC connector	24 V DC
Pull-down resistor	BNC connector	6.1 kΩ
Input level	BNC connector	< 0.8 V (nom.), > 5.0 V (nom.)
Digital control		
Maximum digital voltage	D-Sub port	24 V DC
Pull-down resistor	D-Sub port	20 kΩ
Input level	D-Sub port	< 0.8 V (nom.), > 2.4 V (nom.)
Maximum drain current (OUT)		500 mA
Binning	R&S®LCX-K107 required	
Number of bins		up to 8
Binning modes		nominal, absolute
Sweep	R&S®LCX-K106 required	
Sweep parameters		test frequency, test signal voltage, bias voltage, bias current
Sweep modes		points (1 to 65536 points), interval
Data logging	R&S®LCX-K106 required	
Maximum acquisition rate		10 sample/s
Memory depth		internal (up to 950 Mbyte) or external memory
Voltage resolution		see monitor resolution
Voltage accuracy		see monitor accuracy
Current resolution		see monitor resolution
Current accuracy		see monitor accuracy
Special measurement functions	R&S®LCX-K106 required	dynamic impedance measurements, graphical chart view

Protection functions		
Discharge protection	$V_{max} < \sqrt{2/C}$	1 Joule, max. 200 V (meas.)

Display and interfaces		
Display		TFT 5" 800 × 480 pixel WVGA touch display
Measurement terminal		4 BNC connectors
Remote control interfaces	standard	USB-TMC, USB-CDC (virtual COM), LAN
	optional	IEEE-488 (GPIB)
Remote command processing time		< 5 ms (nom.)
Control interface		15-pin D-Sub trigger I/O
Trigger interface		BNC connector
Save/recall		unlimited (internal or external memory)
Presets		3

Options		
R&S®LCX-Z1 test fixture for axial/radial lead type devices		
Measurable components		resistors, coils or capacitors with axial or radial connecting wires
Frequency range		DC to 10 MHz
DC bias		0 V to 40 V
Weight		approx. 200 g
R&S®LCX-Z2 Kelvin clip lead		
Measurable components		resistors, coils or capacitors
Frequency range		DC to 100 kHz
DC bias		0 V to 40 V
Weight		approx. 250 g
R&S®LCX-Z3 test fixture for SMD components		
Measurable components		SMD resistors, coils or capacitors
Frequency range		DC to 10 MHz
DC bias		0 V to 40 V
Weight		approx. 325 g
R&S®LCX-Z4 test tweezers for SMD components		
Measurable components		SMD resistors, coils or capacitors
Frequency range		DC to 10 MHz
DC bias		0 V to 40 V
Weight		approx. 280 g
R&S®LCX-Z5 transformer test cables		
Measurable components		transformers, transmitters
Frequency range		DC to 100 kHz
DC bias		0 V to 40 V
Weight		approx. 260 g
R&S®LCX-Z11 BNC extension		
Frequency range		DC to 1 MHz
Length		1 m
Weight		approx. 300 g

General data

Environmental conditions		
Temperature (base units and test fixtures)	operating temperature range	+5 °C to +40 °C
	storage temperature range	–20 °C to +70 °C
Humidity	without condensation	5 % to 95 %
Altitude	operating altitude	max. 2000 m above sea level
Power rating		
Mains nominal voltage		100 V to 240 V AC (±10 %)
Mains frequency		50 Hz to 60 Hz
Maximum power consumption		60 W (meas.)
Rated current		max. 1 A (meas.)
Mains fuses		IEC 60127-2/5 T2.0H/250 V
Product conformity		
Electromagnetic compatibility	EU: in line with EU EMC Directive 2014/30/EU	applied standards: ► EN 61326-1 ► EN 61326-2-1 ► EN 55011 (Class A) ► EN 61000-3-2 ► EN 61000-3-3 ► KN 61000-4-11
	Korea	KC mark
Electrical safety	EU: in line with Low Voltage Directive 2014/35/EU	applied harmonized standard: EN 61010-1
	USA, Canada	CNA/CSA C22.2 No. 61010-1-12
RoHS	in line with EU Directive 2011/65/EU	EN IEC 63000
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, 0.3 mm (peak-to-peak), 55 Hz to 150 Hz, 0.5 g constant, in line with EN 60068-2-6
	wideband noise	8 Hz to 500 Hz, acceleration: 1.2 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810E, method 516.4, procedure I
Mechanical data		
Dimensions	W × H × D	362 mm × 99 mm × 357 mm (14.25 in × 3.9 in × 14.06 in)
Weight		2.7 kg (5.95 lb)
Rack installation	R&S®ZZA-GE23	19", 2 HU
Recommended calibration interval	operation 40 h/week over entire range of specified environmental conditions	1 year

R&S®LCX200, rear view

ORDERING INFORMATION

Designation	Type	Order No.
Base units		
LCR meter, 300 kHz	R&S®LCX100	3629.8856.02
LCR meter, 500 kHz	R&S®LCX200	3629.8856.03
Accessories supplied: set of power cables, quick start guide		
Options		
Advanced analysis functions	R&S®LCX-K106	3630.1922.03
Digital I/O ports and binning function	R&S®LCX-K107	3660.7741.03
Extended bias functions	R&S®LCX-K108	3692.9791.03
Frequency upgrade to 1 MHz, for R&S®LCX200	R&S®LCX-K201	3630.1880.03
Frequency upgrade to 10 MHz, for R&S®LCX200	R&S®LCX-K210	3630.1900.03
IEEE-488 (GPIB) interface, for R&S®NGP/LCX	R&S®NG-B105	5601.6000.02
Test fixtures		
Test fixture for axial/radial lead type devices	R&S®LCX-Z1	3639.2296.02
Kelvin clip lead	R&S®LCX-Z2	3638.6446.02
Test fixture for SMD components	R&S®LCX-Z3	3639.2509.02
Test tweezers for SMD components	R&S®LCX-Z4	3639.2515.02
Transformer test cables	R&S®LCX-Z5	3639.2521.02
BNC extension, length: 1 m	R&S®LCX-Z11	3639.2538.02
System components		
19" rack adapter, 2 HU	R&S®ZZA-GE23	5601.4059.02

Warranty		
Base unit		3 years
All other items[1]		1 year
Service options		Contact your local Rohde&Schwarz sales office for more information.
Extended warranty, one year	R&S®WE1	
Extended warranty, two years	R&S®WE2	
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	

Extended warranty with a term of one and two years (WE1 and WE2)
Repairs carried out during the contract term are free of charge[2]. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration coverage (CW1 and CW2)
Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde&Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs[2] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

[1] For options installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.
[2] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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