

# LCR-1 Datasheet

The Sciospec LCR-1 is a compact high accuracy one channel LCR meter with a software for automated measurements and analysis.

Optional equipable with different test adapters for measuring electrical components, foils, thin films and liquids.



## 1 Overview

- one channel compact LCR meter
- connector type: BNC
- 2-, 3- and 4-point measurements
- compatible with test adapters for electrical components, foils, thin films and liquids
- easy to use software for automated measurements and analysis
- large selection of common models, circuits and parameters
- wide frequency range: 100 mHz ... 500 kHz
  - extendable to 1 MHz or 10 MHz
- wide measurement range:
  - $R = 1 \text{ m}\Omega \dots 1 \text{ T}\Omega$
  - $C = 10 \text{ fF} \dots 1 \text{ kF}$
  - $L = 1 \text{ nH} \dots 1 \text{ TH}$
- high accuracy: 0.01% base accuracy

## 2 Measurement specifications

All ports (C, R, WS, W) are available through BNC coaxial connectors.

- high isolation, ultra-low parasitic reed relay switches for channel connect/disconnect with superior performance compared to semiconductor switches
  - $>10\ \text{T}\Omega$  || 0.4 pF isolation at power off or software selected cell disconnect
  - extremely low parasitic capacitance  $< 0.7\ \text{pF}$  offers close to no cell loading
  - max. series resistance 200 m $\Omega$  in connected state
  - zero leakage current in on state
  - zero charge injection, no distortion, no noise contributions beyond thermal noise
- 2-, 3- and 4- point measurements

### 2.1 Set point & excitation signal generator (C port)

- low distortion single sine signal
- compliance voltage  $\pm 4.9\ \text{V}$  (@ 10k $\Omega$  load)
- compliance current
  - 200% of selected current range
  - abs. max.  $\pm 50\ \text{mA}$  (continuous)
  - short circuit current max. 65 mA
- Voltage Excitation Mode:
  - Abs. max. applied potential range  $\pm 5\ \text{V}$
  - DC potential set-point resolution 0.0001% of applied voltage range ( $\sim 19.5\ \text{bit}$  @ 2ms settling time)
  - DC potential set-point accuracy  $\leq 0.1\%$  ||  $\pm 100\ \mu\text{V}$
  - maximum calibrated DC offset error:  $\pm 1\ \text{mV}$
- AC Excitation Signal Range
  - 1 mV ... 1 V (peak amplitude), resolution 0.1 mV in voltage excitation mode
  - Excitation Amplitude Error (uncalibrated):  $\pm 1\%$  typ. ( $\pm 8\%$  max.)
  - Excitation Signal Resolution 0.1% of range
  - Frequency Range 100 MHz to 500 kHz (extendable to 1 MHz or 10 MHz)
  - Frequency Resolution  $< 120\ \text{mHz}$
  - Frequency Precision
    - $\pm 100\ \text{ppm}$  (@25°C)
    - additional  $\pm 10\ \text{ppm}$  over temperature range
    - additional  $\pm 5\ \text{ppm}$  during first year

### 2.2 Potential measurement (R & WS ports)

- potential measurement ranges
  - $\pm 1\ \text{V}$
  - AC voltage measurement range equals selected potential measurement range
  - measured potential resolution  $< 0.008\%$  of potential range
  - measured potential accuracy:
    - max uncalibrated gain error 1%

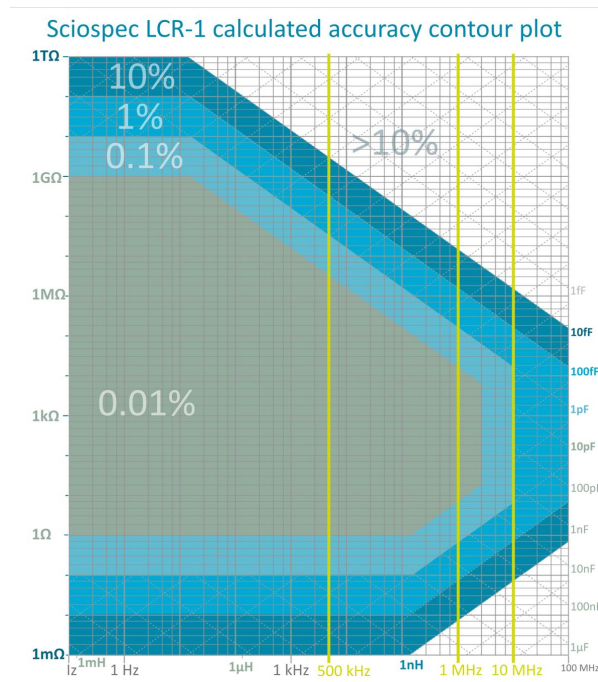
- max uncalibrated offset error 2% of potential measurement range
- electrometer amplifier input
  - input impedance  $\approx 1\text{ T}\Omega$ , 2.3 pF
  - $\pm 1.5\text{ pA}$  input bias current typ. (50 pA max.)

## 2.3 Current measurement (W port)

- 4 current measurement ranges or optional autoranging
  - $\pm 10\text{ mA}$
  - $\pm 100\text{ }\mu\text{A}$
  - $\pm 1\text{ }\mu\text{A}$
  - $\pm 10\text{ nA}$
  - autoranging
- AC current measurement range equals selected current range
- measured current resolution  $< 0.008\%$  of current range
- max uncalibrated gain error
  - 0.1% for  $\pm 10\text{ mA}$  range
  - 0.1% for  $\pm 100\text{ }\mu\text{A}$  range
  - 1% for  $\pm 1\text{ }\mu\text{A}$  range
  - 5% for  $\pm 10\text{ nA}$  range
- max uncalibrated offset error 2% of current measurement range  $\pm$  input bias current
- current amplifier input bias current  $\pm 10\text{ pA}$  typ. (max.  $\pm 1\text{ nA}$ )

## 2.4 Measurement ranges

- Resistance Measurement Range:  $1\text{ m}\Omega \dots 1\text{ T}\Omega$
- Capacitance Measurement Range:  $10\text{ fF} \dots 1\text{ kF}$
- Inductance Measurement Range:  $1\text{ nH} \dots 1\text{ TH}$ 
  - 0.01 % base accuracy
  - accuracy contour plot (absolute impedance values):



Note: The accuracy contour plot was determined under lab conditions and should be used for reference purposes. Please note that the true limits of an impedance measurement are influenced by all components in the system, like cables, cell, and the instrument.

## 3 Master interfaces

### 3.1 Isolated full speed USB interface

- standard conformity: USB 2.0, FS (12 Mbits/s)
- connector: Mini USB Type B
- protocol: Full Speed USB 2.0
- ESD protection: Class 3A contact ESD performance per ANSI/ESD STM5.1-2007
- isolation:
  - 2500 V rms for 1 minute per UL 1577
  - IEC 60950-1: 600 V rms (basic)
  - DIN V VDE V 0884-10 (VDE V 0884-10):2006-12
  - VIORM = 560 V peak

## 4 General specifications

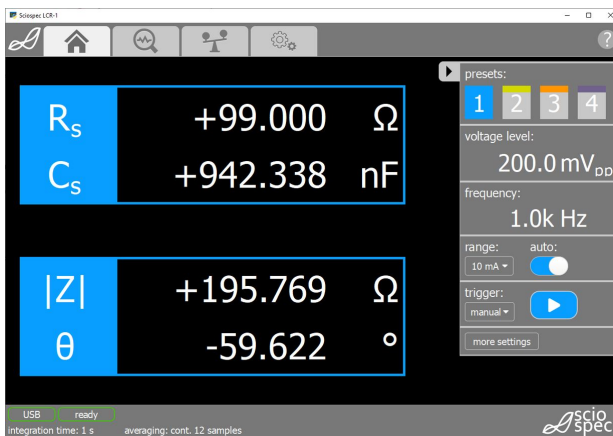
- power requirements: 12VDC (typ.), 15W (max), Connector DC Jack, (Type: Switchcraft PN: 712A)
- timing accuracy: 1% accuracy over the full temperature range
- dimensions: 112 mm x 58 mm x 212 mm (width x height x depth)
- weight: 1.0kg (typical)
- operating conditions: 0°C to 40°C, <80% relative humidity non condensing, 0...3000m altitude
- non-operating conditions: -25°C to 80°C, <80% relative humidity non condensing, The temperature gradient should not exceed 1K/min to reach operating conditions.

## 5 Measurement and analysis software

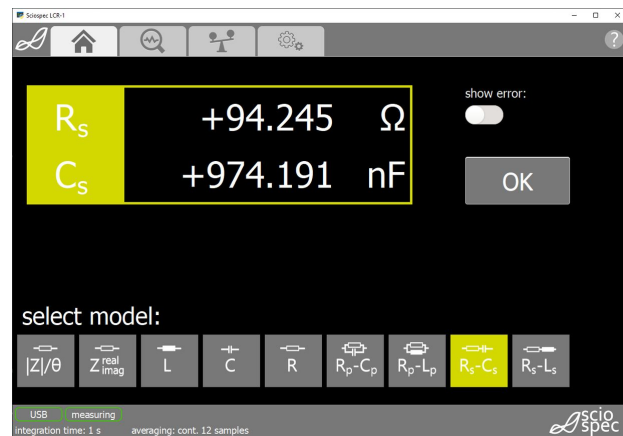
The LCR-1 comes with a PC based software for automated measurements and analysis.

- system requirements: Windows® 8 or newer (Windows® 7 should work too, but is not supported)
- intuitive, easy to use graphical interface
- up to 4 parameters displayed at the same time
- automatic ranging
- 4 adjustable presets for storing measurement parameters - consistently color-coded for intuitive operation
- saving and loading of measurement parameters
- continuous and manual trigger mode
- More settings include: port configuration, integration time, averaging, compensation
- Different models selectable: Impedance, phase, Real and Imaginary value, L, C, R, RC parallel / series and RL parallel / series

### 5.1 Home View



### 5.2 Model selection



## 6 Optional test adapters

### 6.1 Component Test fixture 10 MHz

- for easy connection of wired components
- for measurements up to 10 MHz
- short plate included
- size: 105 mm x 25 mm x 68 mm (width x height x depth)
- weight: ca. 150 g

### 6.2 SMD Test fixture

- for connection of SMD components
- SMD package types from 0201 to 2920 (imperial)
- size: 123 mm x 64 mm x 88 mm (width x height x depth)
- weight: ca. 200 g



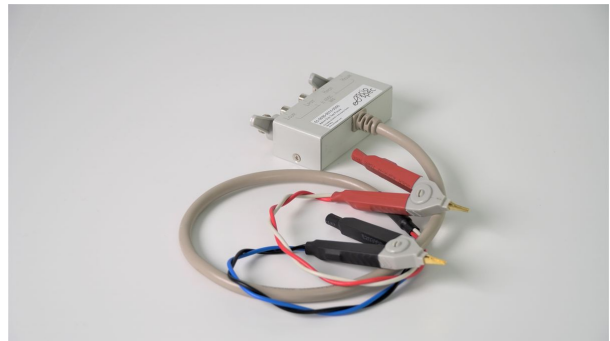
### 6.3 Kelvin clips

- for clamp/clip connection
- cable length: 1 m



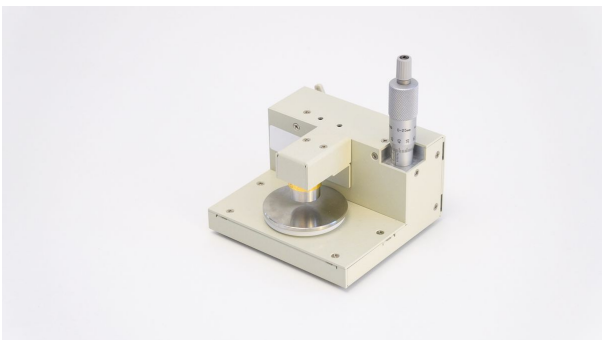
### 6.4 Kelvin clips fixture

- for clamp/clip connection
- easy connection to the device
- cable length: 80 cm



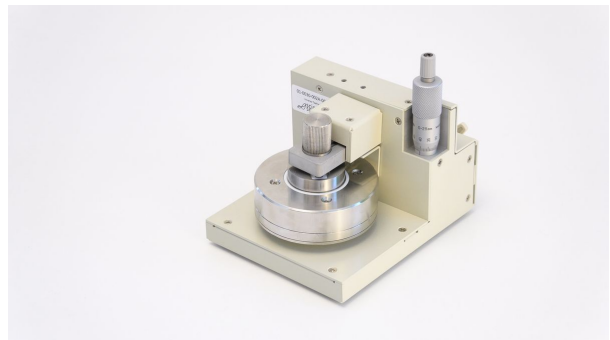
### 6.5 Dielectric Test fixture

- for connection of foils and thin films with thickness up to 10 mm
- size: 115 mm x 155 mm x 126 mm (width x height x depth)
- weight: ca. 850 g



### 6.6 Liquid Test fixture

- for measuring liquids and solutions
- size: 115 mm x 129.5 mm x 159 mm (width x height x depth)
- weight: ca. 1700 g



## 7 Coming soon

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- advanced compensation
- automatic/guided model selection
- external trigger through sync in/out ports (e.g. through low level isolated interface or optional isolated sync module)
- ethernet interface
- high resolution DC bias/offset generation ( $\pm 1$  V)
- new software modes:
  - Time Trace Mode
  - Frequency Sweep Mode
  - Pass Fail Test Mode