

# Data Sheet

## 500 kHz / 1 MHz Precision LCR Meter Models 894 & 895



### Industry-Leading Performance

The 894 and 895 are high accuracy LCR meters capable of measuring inductance, capacitance, and resistance of components and materials at DC or from 20 Hz to 500 kHz or 1 MHz respectively. These LCR meters provide flexible AC and DC test signal configuration. AC test signal voltage is variable from 5 mVrms to 2 Vrms, the AC current is adjustable up to 66.7 mArms, depending on the AC impedance selected, and a DC bias signal can be added. The vivid 4.3-inch TFT LCD offers a clear view of all measured and setting values along with BIN sorting comparator results and a handy Zoom feature that enlarges the measured values to full screen. With a basic accuracy of 0.05%, auto level control (ALC), open / short / load correction and cable length compensation, these meter are perfect tools for R&D, manufacturing and quality control applications.

### DC Biasing

Both the 894 and 895 feature a DC bias source which allows the meter to apply a DC signal to the device under test to simulate in-circuit conditions.

DC biasing is commonly used to measure capacitance of ceramic, MLCC, polyester and other capacitors with high dielectric constants. These type of capacitors exhibit a significant change in capacitance with a DC voltage applied. By controlling the DC voltage, users can obtain a more deterministic measurement result. Other applications include evaluation of cored-inductors and junction capacitance of semiconductor devices.

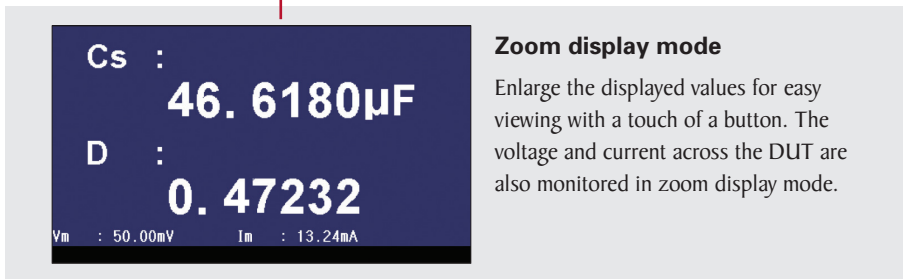
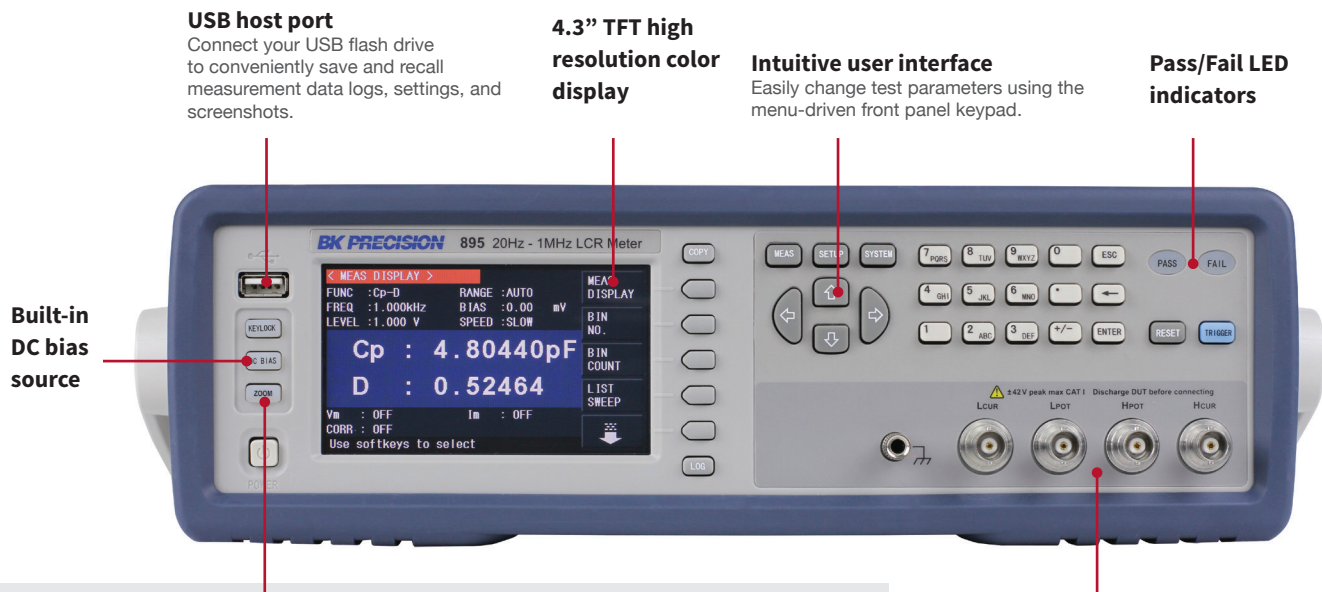
The DC bias source is adjustable from -5V to +5V / -50 mA to +50 mA. Additionally the voltage or current levels can be swept while logging the resulting capacitance.

### Features & Benefits

- AC test signal voltage adjustable up to 2 Vrms
- 3 AC current ranges, selectable via 30 Ω, 50 Ω or 100 Ω internal AC impedance. The 30 Ω setting provides up to 66.7 mArms of drive current, sufficient for larger inductors and transformers.
- Built-in DC bias source adjustable from -5V to +5V / -50 mA to +50 mA
- Fast measurement speed up to 13 ms/reading to increase manufacturing throughput
- Adjustable measurement speed for fast readout or better accuracy
- 201-point programmable list sweep function providing ability to sweep frequency, AC and DC bias voltage/current levels
- Auto-level control to maintain the measurement signal applied to the DUT at a constant level
- Test signal voltage and current monitoring
- BIN comparator function to sort components in up to 10 bin locations
- Handler interface for easy integration with a component handler
- 1 m and 2 m cable compensation
- 4-terminal fixture and Kelvin clip test leads included
- Transformer test function with optional transformer test fixture TL89T1
- Versatile trigger functionality (internal, external, bus and manual)
- Standard USB, LAN, and GPIB (895 only) interface for remote control using SCPI commands

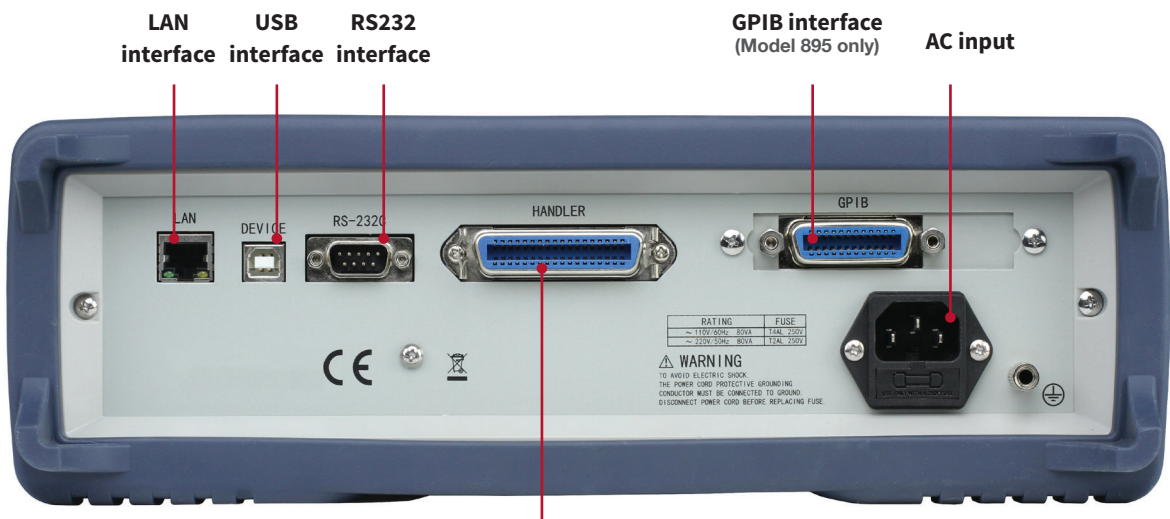
Model	894	895
Measurement parameters	L, C, R, G, X, Z, Y, B, θ, Q, D, DCR	
Basic accuracy	0.05%	
DCR measurement range	0.01 Ω - 100 MΩ	
Test frequency range	20 Hz - 500 kHz	20 Hz - 1 MHz

## Front panel



**Variable test signals**  
The instrument provides settable voltage levels from 5 mVrms to 2 Vrms to evaluate your DUT.

## Rear panel



**Handler interface**  
36-pin connector to interface with component handler via input/output control signals. Includes bin and list sweep comparator results and end of measurement (EOM) indicator output signals, external trigger, and key lock input signal.

## Powerful Features

### Programmable List sweep

< LIST SWEEP DISP >					MEAS DISPLAY
MODE	:SEQ				
No.	FREQ[Hz]	Cs[F]	D [ ]	CMP	BIN NO.
001	20.0000	102.797n	0.00162	L	
002	5.01990k	101.775n	0.00773	P	
003	10.0198k	101.408n	0.00973	P	
004	15.0197k	101.149n	0.01098	P	
005	20.0196k	100.946n	0.01183	P	
006	25.0195k	100.780n	0.01255	P	
007	30.0194k	100.637n	0.01315	P	
*008	35.0193k	100.511n	0.01371	P	
009	40.0192k	100.400n	0.01423	P	
010	45.0191k	100.301n	0.01466	P	

Use the built-in linear and logarithmic sweep function, supporting up to 201 sweep points, to conveniently display, analyze and store primary and secondary parameters of a component. Sweep test frequency, AC source voltage and current levels, DC bias source voltage and current levels. A delay can be programmed after each sweep point. The list sweep can be triggered internally, manually or externally and executed in sequence or step mode.

### Bin sorting function

< BIN No. DISP >			ON
FUNC	: R-X	RANGE	: AUTO
FREQ	: 1.000kHz	BIAS	: 0.00 mV
LEVEL	: 1.000 V	SPEED	: SLOW
		COMP	: ON
<b>BIN OUT</b>			
R	: 7.08130 Ω	X	: -1.62169kΩ
CAL	: OFF		

Quickly sort components using the instrument's 9 primary BINs, a secondary BIN and out-of-specification BIN. The results can be displayed in a table on-screen or output via the handler interface. High and low limits for each bin can be set up in absolute, tolerance or sequential mode with Pass/Fail indicator.

### Remote PC control

< LAN SETUP >		SYSTEM SETUP
LAN Status	: Working Properly	LAN SETUP
HOST NAME	: 89x	
DHCP	: OFF	
AUTO IP	: OFF	
IP ADDR	: 10. 0. 1. 55	
SUBNET MASK	: 255.255.254. 0	
GATEWAY	: 10. 0. 1.254	DEFAULT SETTINGS
DNS SERVER1	: 10. 0. 1.254	SYSTEM RESET
DNS SERVER2	: 10. 0. 1.254	

Integrate your LCR meter into an automated test system and control it from a PC using SCPI commands via the RS232, USB, LAN, or GPIB (895 only) interface.

### Transformer measurements (optional)

Using optional test fixture TL89T1, the 894 and 895 can test the primary and secondary inductance  $L_1$ ,  $L_2$ , turn ratio ( $N$ ,  $1/N$ ), mutual inductance ( $M$ ), and primary and secondary direct-current resistance ( $R_2$ ) of a transformer directly. Additionally, the two common transformer parameters winding equivalent capacitance  $C_o$  and leakage inductance  $L_k$  can be characterized indirectly.

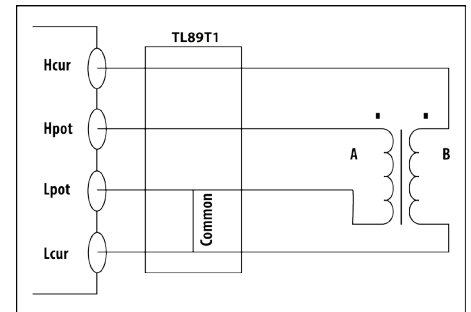
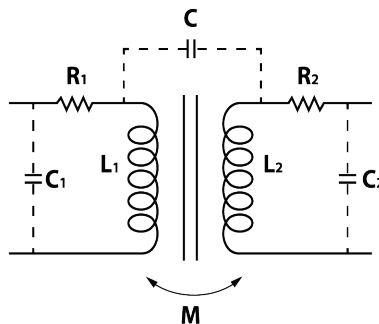
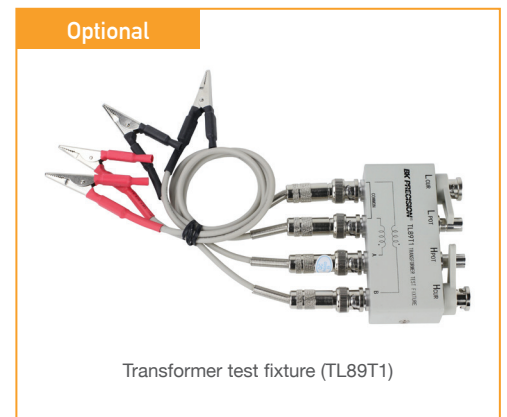
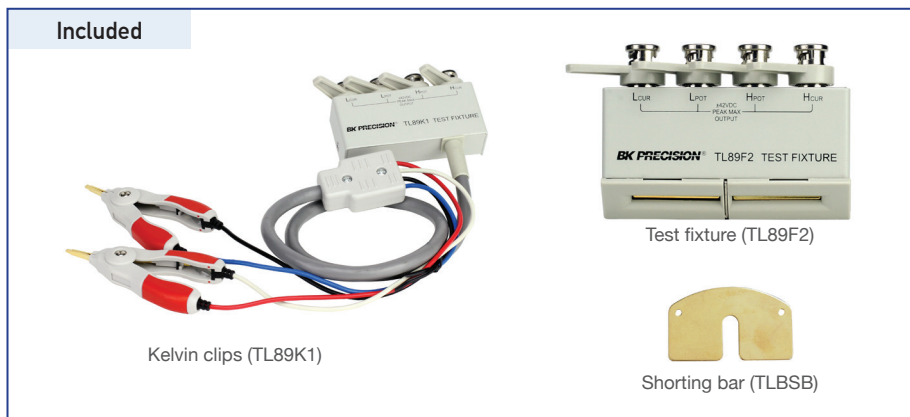


Diagram showing the TL89T1 connected to a transformer under test.

### Flexible test accessories

Standard accessories shipped with each unit are Kelvin clip test leads for 4-wire measurements, a test fixture, and shorting bar. The optional transformer test fixture allows users to measure transformer parameters.



## Specifications

Valid after 30 minutes of warm up time, operating at 23 °C ± 5 °C

Test Signal Frequency			
Model	Range	Minimum resolution	Accuracy
894	20 Hz - 500 kHz	0.01 Hz	0.01 %
895	20 Hz - 1 MHz		

Test Signal Levels		
AC source (ALC* OFF)		
<b>Voltage Accuracy</b>	10% x set voltage ± 2mV	
<b>Voltage Level</b>	<b>Resolution</b>	
5 mVrms - 100 mVrms	100 µVrms	
100 mVrms - 1 Vrms	1 mVrms	
1 Vrms - 2 Vrms	10 mVrms	
<b>Current Accuracy</b>	10 % x set current ± 10 µA	
<b>Current Range</b>	<b>Impedance</b>	
166.7 µArms - 66.7 mArms	30 Ω	
100.0 µArms - 40.0 mArms	50 Ω	
50.0 µArms - 20.0 mArms	100 Ω	
AC source (ALC* ON) <sup>1</sup>		
<b>Voltage</b>	Range	10 mVrms - 1 Vrms
	Accuracy	6% x set voltage ± 2 mV
<b>Current</b>	Range	100 µArms - 10 mArms
	Accuracy	6 % x set current ± 10 µA
DC bias source		
<b>Voltage</b>	Range	-5 V to +5 V
	Accuracy	1 % x set voltage ± 5 mV
	Resolution	0.01 mV
<b>Current</b>	Range	-50 mA to +50 mA
	Accuracy	1 % x set current ± 50 µA
	Resolution	0.1 µA

\*Auto Level Control

1: Resolution and impedance see AC source (ALC OFF) specification

Measurements		
<b>Measurement parameters</b>	L, C, R, G, X, Z, Y, B, θ, Q, D, DCR	
<b>Transformer measurement parameters<sup>2</sup></b>	L2A, L2B, N, I/N, M	
<b>Basic accuracy</b>	0.05 %	
<b>AC source Output impedance (± 2%)</b>	30 Ω, 50 Ω, 100 Ω	
<b>Typical measurement time (≥10 kHz)</b> (excluding display refresh time)	Fast	13 ms / measurement
	Medium	67 ms / measurement
	Slow	187 ms / measurement
<b>Equivalent circuit</b>	Series, Parallel	
<b>Range mode</b>	Auto, Hold	
<b>Averaging</b>	1-255 measurements	
<b>Correction function</b>	Open, Short and Load correction	

2: Requires optional fixture TL89TI

Measurements		
<b>Cable length compensation</b>	0, 1, & 2 meters	
<b>Math operations</b>	Direct reading, ΔABS, Δ%	
<b>Trigger mode</b>	Internal, Manual, External, Bus	
<b>Delay time setup</b>	Time from trigger to start: 0 to 60 seconds	
	Resolution: 1 ms	
<b>Comparator (Bin sorting)</b>	10-bin sorting, primary bins BIN1-BIN9 and OUT, secondary bin AUX	
	Bin counter: 0 to 999,999	
	PASS/FAIL indication via front panel LED or handler interface signal	
<b>List sweep</b>	201 sweep points	Sweep test frequency, test signal AC voltage, test signal AC current, test signal DC bias voltage and test signal DC bias current
	Measurement parameters	Primary and secondary
	Sweep modes	Linear or logarithmic
	Trigger mode	Sequential and Step
	Comparator	One pair of lower and upper limits for primary or secondary parameter (user selectable)
<b>Internal non-volatile memory</b>	Save / recall 40 setups	

General		
<b>External USB memory</b>	Save / recall setups, screenshots, measurements and sweep data logs	
<b>Remote interface</b>	USB (USBTMC or virtual COM), RS232, LAN, GPIB (895 only)	
<b>Handler interface</b>	36-pin connector	
<b>AC input</b>	Voltage	110/220 VAC ±10%
	Frequency	47 – 63 Hz
<b>Power consumption</b>	Max. 80 VA	
<b>Operating temperature</b>	0 °C to 40 °C	
<b>Storage temperature</b>	-10 °C to 70 °C	
<b>Relative humidity</b>	Up to 80%	
<b>Display</b>	4.3" TFT color display	
<b>Dimensions (WxHxD)</b>	without bezel: 280 mm × 88 mm × 370 mm (11.02" × 3.46" × 14.56")	
	with bezel: 369 mm × 108 mm × 408 mm (14.52" × 4.25" × 16.06")	
<b>Weight</b>	5 kg (11 lbs)	
<b>Safety</b>	EN61010-1:2001, EU Low Voltage Directive 2006/95/EC	
<b>Electromagnetic Compatibility</b>	Meets EMC Directive 2004/108/EC, EN61326-1:2006	

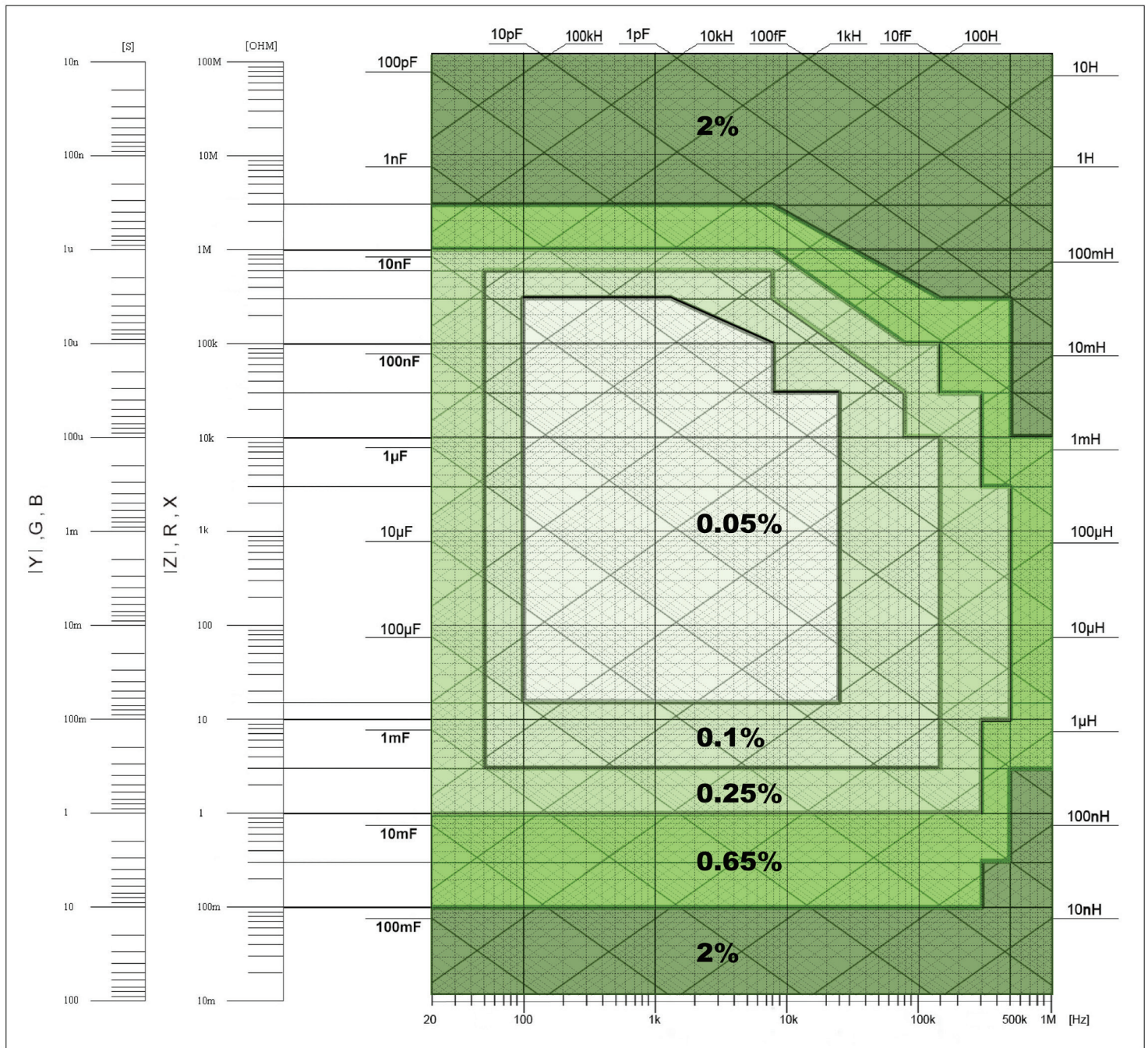
Three-Year Warranty	
<b>Standard accessories</b>	AC power cord, 4-wire Kelvin clip test lead, 4-terminal test fixture, shorting bar, certificate of calibration, test report
<b>Optional accessories</b>	Transformer test fixture TL89TI



## Measurement Accuracy

The chart below depicts the basic measurement accuracy under the following conditions: AC test signal level 0.5 Vrms or 1 Vrms, measurement speed Slow or Medium, cable length 0 m, DC bias OFF,  $D_x \leq 0.1$  or  $Q_x \leq 0.1$  respectively. When selecting measurement speed Fast, double the accuracy value obtained from the chart.

For more detailed measurement accuracy specifications and other test conditions, refer to the user manual.



**DCR Accuracy:**  $A(1 + R_x / 5 \text{ M}\Omega + 16 \text{ m}\Omega / R_x)[\%] \pm 0.2 \text{ m}\Omega$   $A=0.25$  for slow & medium speed,  $A=0.5$  for fast speed