

# 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.

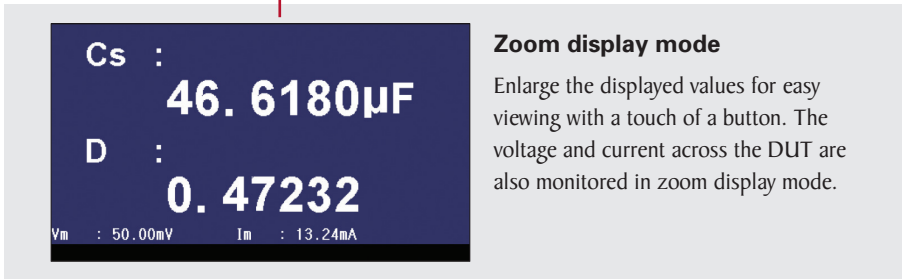
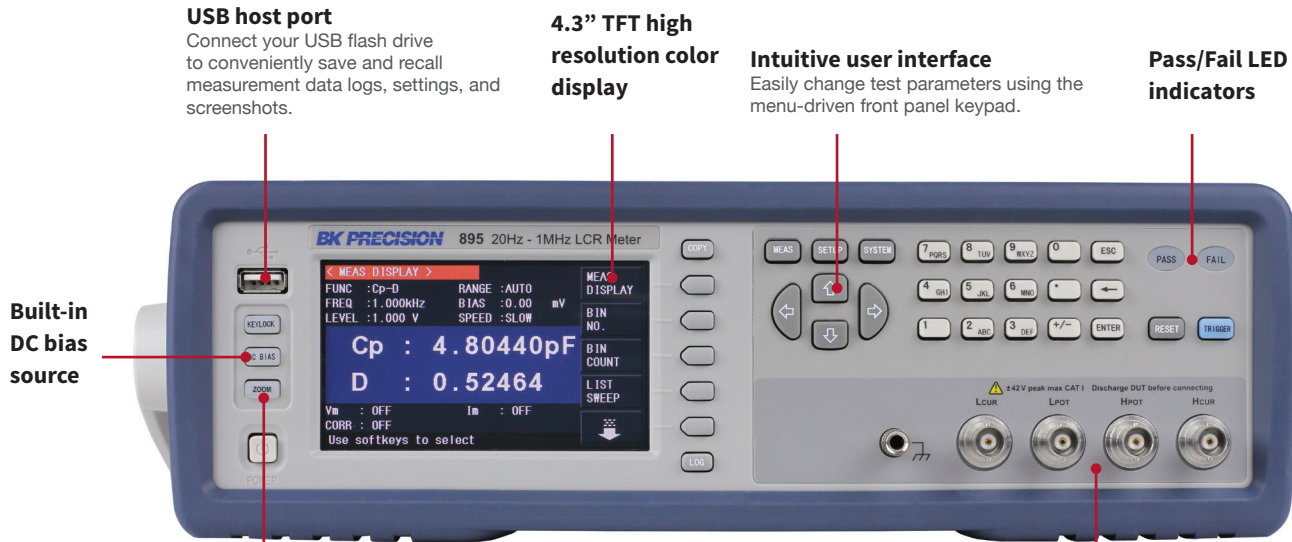
The DC bias source is adjustable from -5V to +5V / -50 mA to +50 mA. Additionally the voltage or current levels can be swept while logging the resulting capacitance.

### 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 meter 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

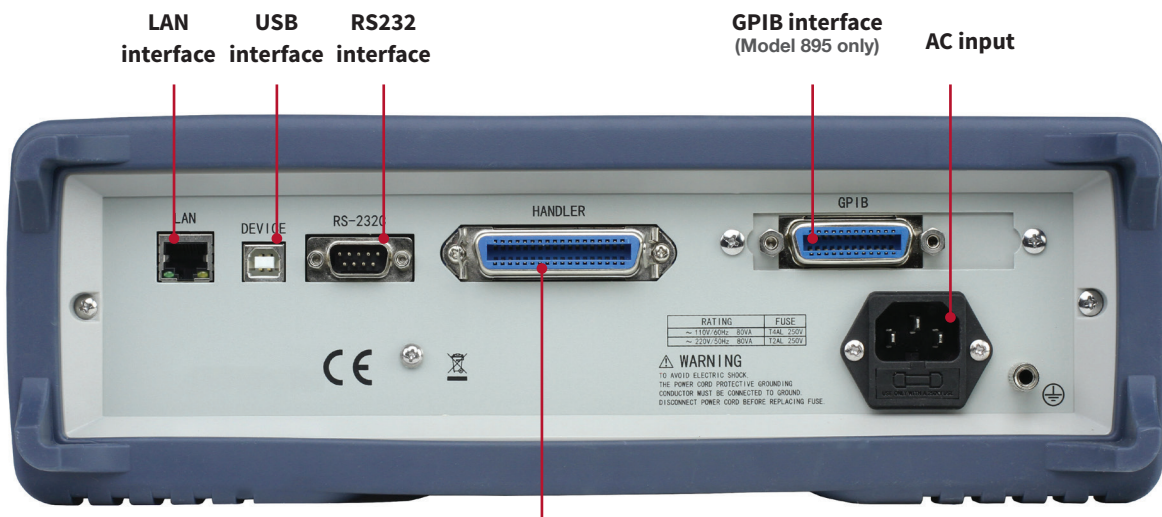
| Model                  | 894                                  | 895           |
|------------------------|--------------------------------------|---------------|
| Measurement parameters | L, C, R, G, X, Z, Y, B, θ, Q, D, DCR |               |
| Basic accuracy         | 0.05%                                |               |
| 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           |          |          |         |     | BIN NO.      |
| No.                 | FREQ[Hz] | Cs[F]    | D [ ]   | CMP | BIN COUNT    |
| 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 | F   |              |
| 005                 | 20.0196k | 100.946n | 0.01183 | F   |              |
| 006                 | 25.0195k | 100.780n | 0.01255 | F   |              |
| 007                 | 30.0194k | 100.637n | 0.01315 | F   |              |
| *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   |  | OFF |
| 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 ( $N_1/N_2$ ), mutual inductance ( $M$ ), and primary and secondary direct-current resistance ( $R_1$ ,  $R_2$ ) of a transformer directly. Additionally, the two common transformer parameters winding equivalent capacitance  $C_o$  and leakage inductance  $L_k$  can be characterized indirectly.

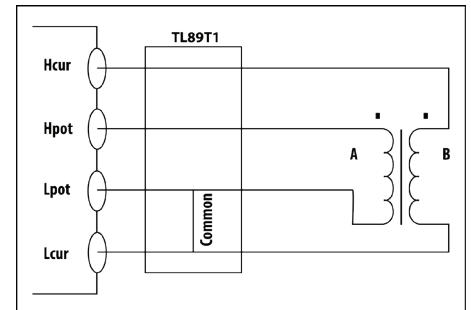
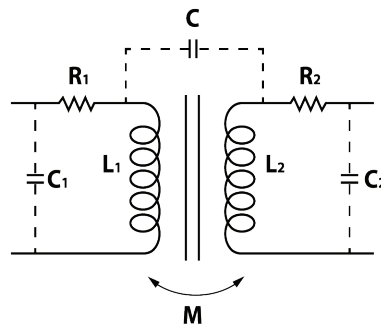
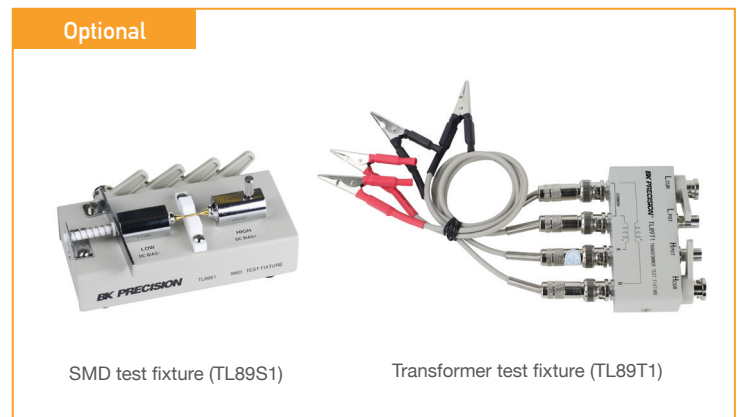
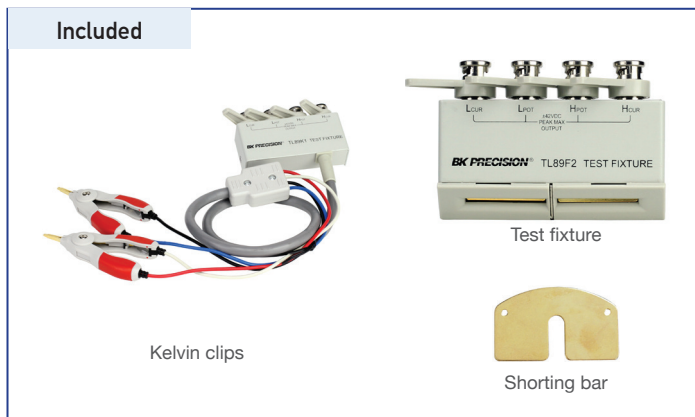


Diagram showing the TL89T1 connected to a transformer under test.

### 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><br>(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, & I meter   |   |
| <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  |   |

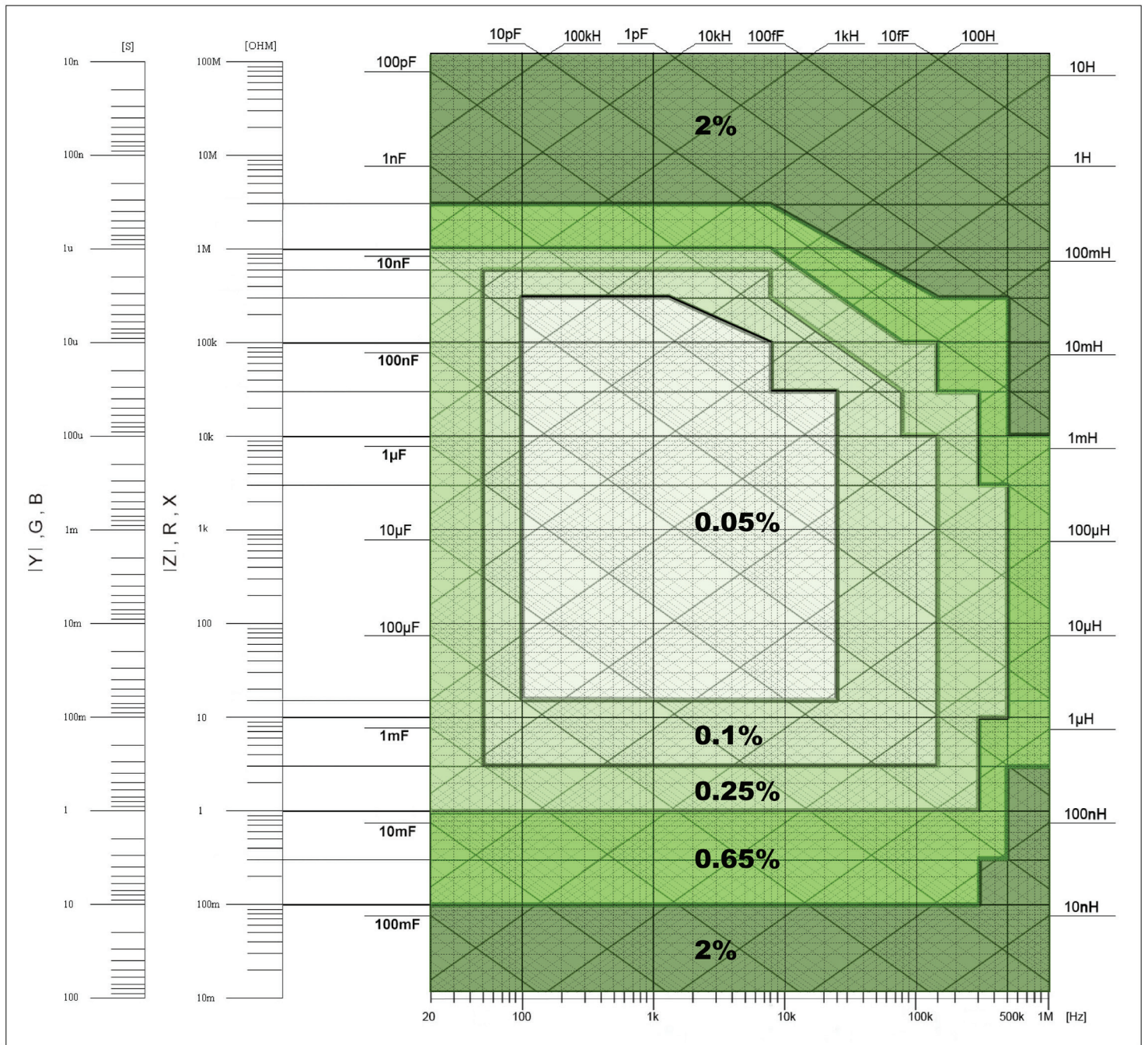
| General                              |  |                  |
|--------------------------------------|--|------------------|
| <b>External USB memory</b>           | Save / recall setups, screenshots, measurements and sweep data logs  |                  |
| <b>Remote interface</b>              | USB (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<br>(11.02" × 3.46" × 14.56")<br>with bezel: 369 mm × 108 mm × 408 mm<br>(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

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