

HIOKI

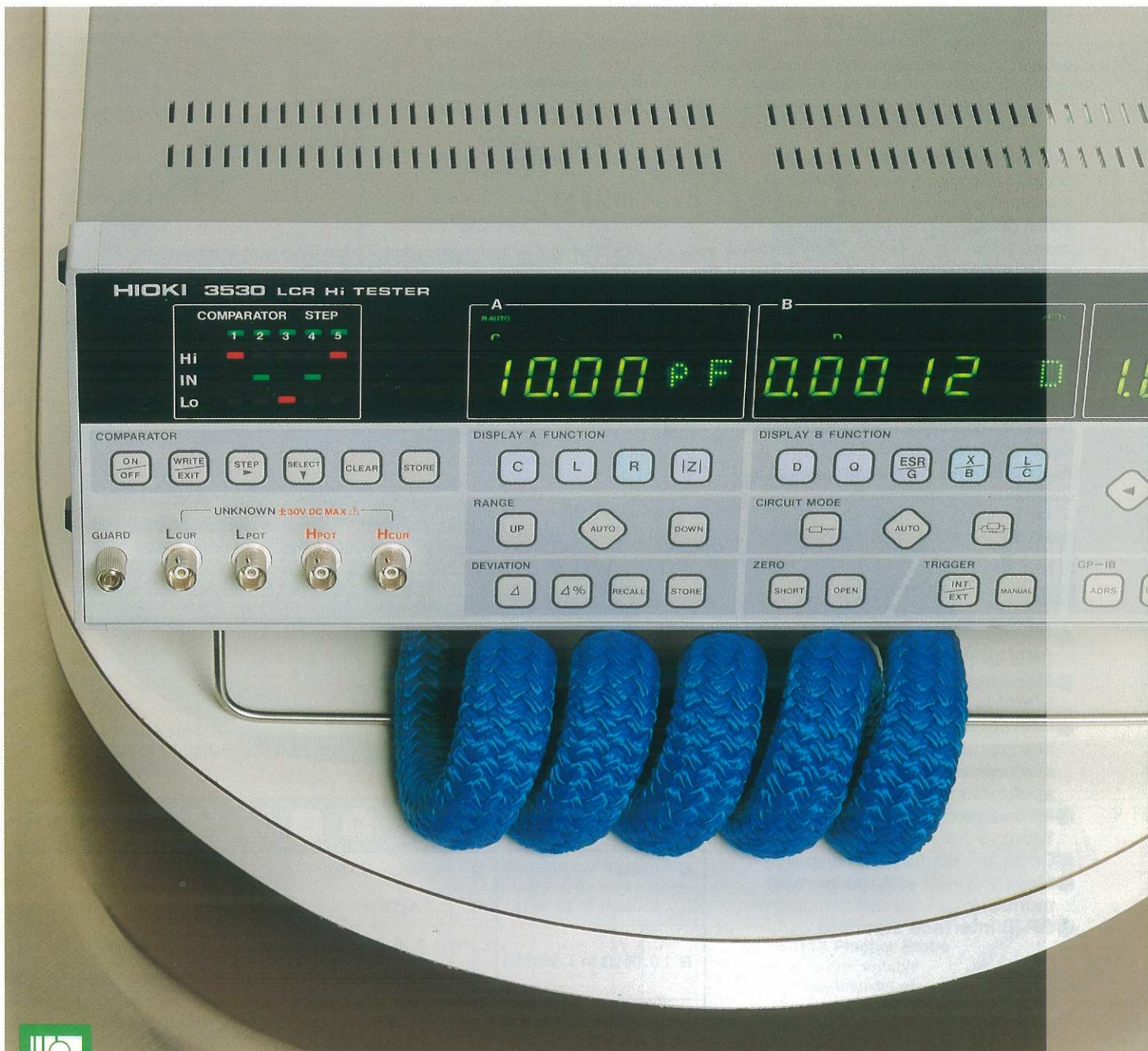


Evaluation measurement across a wide range of operating conditions

Measurement Frequency Variable From 1kHz to 1MHz

LCR HI TESTER

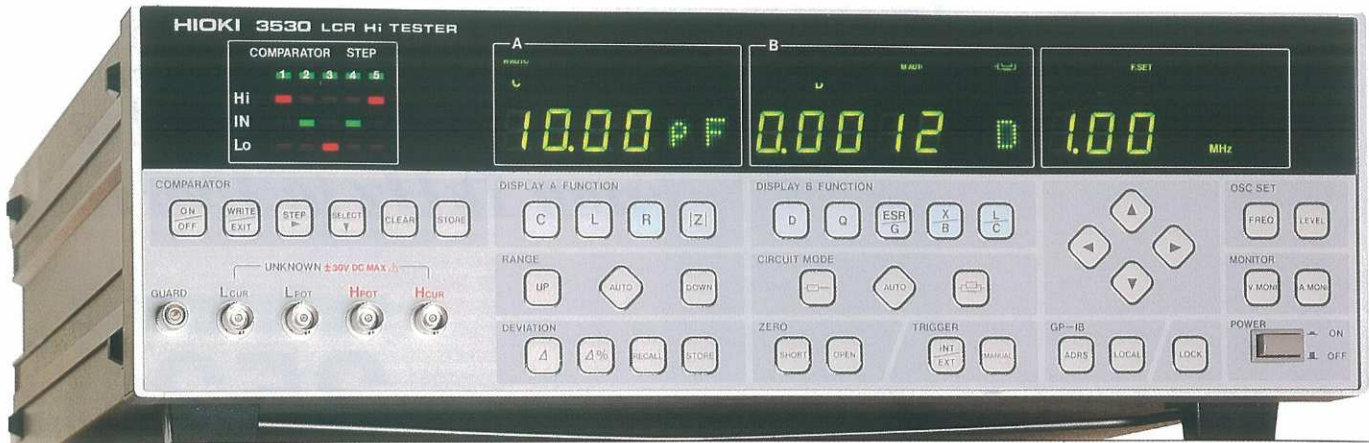
3530



LCR Meter

GP-IB Standard

Built-in Multifunction Comparator for Easy Product Evaluation

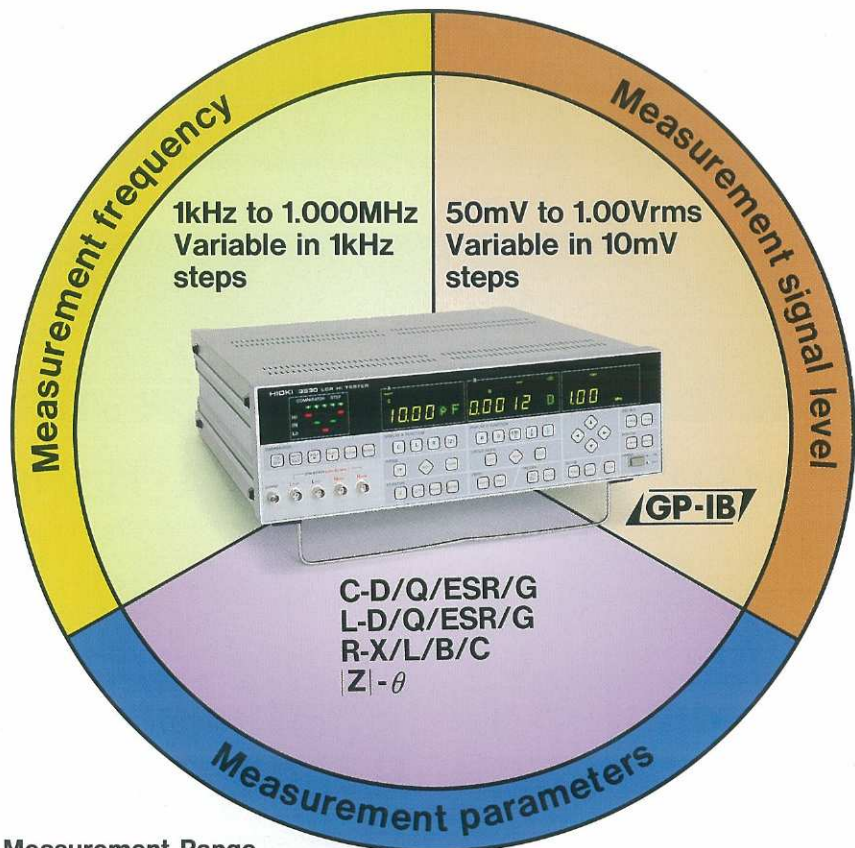


The 3530 LCR Hi Tester makes it possible to measure parts with a measurement signal that closely emulates actual operating conditions. The measurement signal can be finely adjusted within wide frequency (1 kHz to 1 MHz) and level (50 mV to 1 Vrms) ranges. In addition to basic functions, the 3530, designed primarily for line use, is equipped with a built-in comparator for evaluating parts according to up to five measurement conditions, including frequency dependence and measurement signal level dependence. This LCR meter is suitable for both production and inspection line applications.



Features

- Measurement frequencies from 1kHz to 1MHz
- Measurement signal level from 50mV to 1Vrms
- Internal multi-function comparator optimum for evaluation measurement in line applications
- Measurement speed: Approx. 100ms
- Deviation display, $\pm\%$ display
- Measurement voltage/current monitor
- GP-IB interface standard



Measurement Range

Display-A		Display-B						
C	L	R	Z	D	Q	ESR/G	X/B	L/C
C : 0.01pF to 1.999mF	L : 0.01 μ H to 19.99H	R : 0.001 Ω to 1.999M Ω	Z : 0.001 Ω to 1.999M Ω	D : 0.0001 to 3.0000	Q : 0.1 to 1000	<input type="checkbox"/> \square \sim \square ESR : 0.001 Ω to 1.999M Ω	<input type="checkbox"/> \square \sim \square X : 0.001 Ω to 1.999M Ω / L : 0.01 μ H to 19.99H	L/C : 0.01 μ S to 1.999S
						<input type="checkbox"/> \square \sim \square B : 0.01 μ S to 1.999S / C : 0.01pF to 1.999mF		
						<input type="checkbox"/> \square \sim \square θ : $\pm 0.01^\circ$ to $\pm 90.00^\circ$		

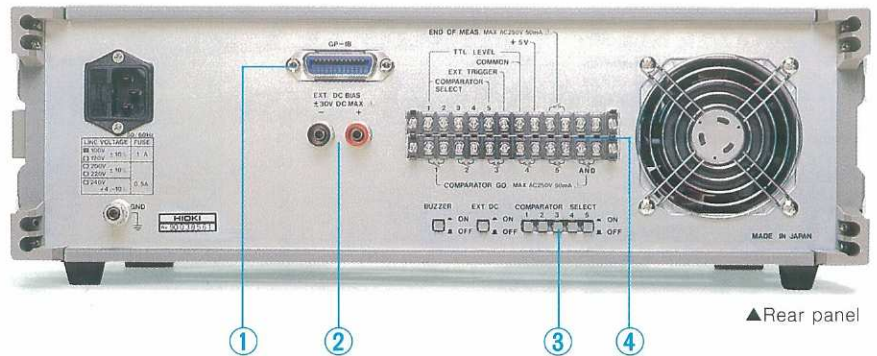
(Note) ESR, X, and L are in series equivalent circuit mode.
G, B and C are in parallel equivalent circuit mode.

An LCR Meter Primarily Designed for Line Use



Applications

The comparator function can be set to a maximum of five steps, and independent setting of measurement frequency, signal level, parameters, and upper and lower limit values is possible for each step. Moreover, since steps can be freely combined, tasks like testing the same part under different conditions, memory of measurement conditions or bin sorting on the line are easily accomplished. Since the result of comparison is obtained as an output, the unit can be incorporated to automatic inspection lines.



▲Rear panel

- ① GP-IB interface
- ② External DC bias input terminal (max. ± 30 V)
- ③ Comparator selector switch
For manual comparator step selection.

- ④ Comparator interface
External comparator step selection and measurement start can be set by TTL level negative logic. Both the result of comparison at the selected step and the general evaluation are output.

1 Measurement Parameters Comparator

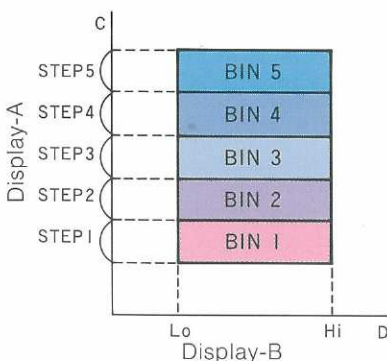
Comparison can be applied to the parameters of either display A or B, or to their logic AND. Parameters can be combined as shown in the table below, and values can be specified for either the upper or lower limit, or for both.

Display-A	Display-B
C	D
L	D
R	
Z	θ

2 Classification in Up to Five Groups

Each parameter can be selected and sorted in up to five groups using function [F]. The result of comparison is shown on the LED display and output through the comparator interface on the rear panel, making the unit applicable to automatic systems.

- Example of sorting according to the logic AND of C: capacitance and D: loss coefficient.



3 Memory of Up to Five Measurement Conditions

Since measurement function, measurement signal and other data can be independently set and registered for each step, the unit turns into five completely different LCR meters with comparator.

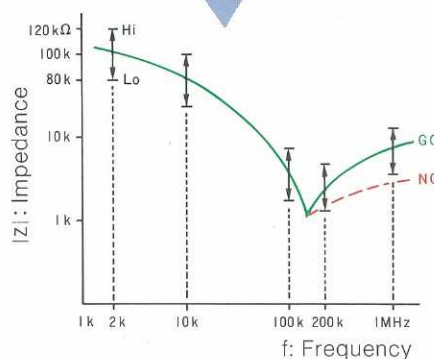
4 Up to Five Evaluation Points for Each Sample

For samples that give different values according to measurement frequency, voltage level, etc., measurement conditions can be changed in up to five steps for evaluation.

- Testing Devices with Signal-dependent characteristics
Setting Example

(1 steps): Z - θ f: 2kHz, V: 1V rms	
Hi - 1200	Lo - 800 (200k Ω range)
(2 steps): Z - θ f: 10kHz, V: 1V rms	
Hi - 1000	Lo - 600 (200k Ω range)
⋮	
(5 steps): Z - θ f: 1MHz, V: 1V rms	
Hi - 1200	Lo - 800 (2k Ω range)

Measurement



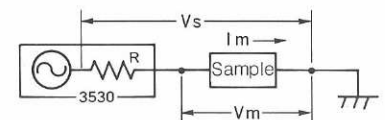
Other Functions

Deviation Measurement

At each parameter C, L, R, Z, the deviation between a set reference value and the measurement value can be obtained as Δ = Deviation or $\Delta\%$ = Percentage of deviation, letting you grasp sample scattering at a glance.

Monitor Function

Voltage between terminals and current of the measured parts can be monitored.



Vs: Measurement signal level
Vm: Monitor voltage, Im: Monitor current
R: Output impedance (fixed to approx. 100 Ω)

Options (sold separately)

- 9261 Test Fixture
4-terminal test fixture for general parts. Cables are 1m long for handling flexibility.



- 9143 Pincher Probe
Test fixture suitable for measurement of chip parts, etc.



(Note) Frequency, signal level and range of measurement are limited.

Specification

Measurement frequency: 1kHz to 1MHz, frequency accuracy $\pm 0.01\%$ (variable in 1kHz steps)
 Measurement parameters: C-D,Q (ESR G)
 L-D,Q (ESR G)
 R-(X, B, L, C)
 $|Z|-\theta$

Note: ESR, X and L are in series equivalent circuit mode, G, B and C are in parallel equivalent circuit mode

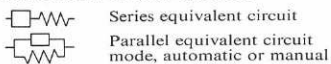
Measurement range:

$|Z|, R, X, ESR$: 0.001 Ω to 1.999M Ω
 C: 0.01pF to 1.999mF
 L: 0.01 μ H to 19.99H
 G,B: 0.01 μ S to 1.999S
 D: 0.0001 to 3.0000
 Q: 0.1 to 1000
 θ : $\pm 0.01^\circ$ to $\pm 90.00^\circ$

(actual measurement range will vary with measurement frequency and signal level)

Measurement signal level: 50mV to 1Vrms (variable in 10mV steps).
 Output impedance approx. 100 Ω (fixed)

Measurement circuit modes:



Measurement terminals: 4-terminal structure
 Measurement signal level monitor:

Voltage: 1mV to 1.00Vrms.
 Current: 0.01mA to 10.0mA

Trigger functions: Internal, external, manual
 Zero adjust function: Open and short calibration

Note) Directly-corrected frequencies: 1k, 2k, 4k, 10k, 20k, and 40kHz, and in 50kHz intervals from 100 kHz to 1 MHz. Other frequencies are corrected by interpolation.

Deviation range: Displays deviation from preset reference in $\pm\%$
 Up to five steps

Comparator: Fixes and stores switch settings
 Lock function: Fixes and stores switch settings

Display: Main display (max. 3 1/2 digits)
 Sub display (max. 4 1/2 digits)
 Frequency, monitor (3 digits)

DC bias: External DC bias ± 30 V max.

Measurement speed: Approx. 100ms max. (Not including time required for measurement frequency signal level and range switching.)

Interfaces: GP-IB standard, External interface for comparator

Temperature coefficient: 500ppm/ $^\circ$ C
 Operating temperature/humidity: 0 $^\circ$ C to 40 $^\circ$ C, 80% RH max. (with no condensation).

Power supply: 100, 120, 200, 220VAC $\pm 10\%$, 240VAC +4% -10%, 50/60Hz (Specify at order)

Consumed power: Approx. 60VA
 Dimensions, weight: 133H x 430W x 435Dmm approx. 10kg

Accessories: Power cord (1), Spare fuse (0.5A-250V) (1)

Note

The 3530 is not provided with a test fixture. Please purchase an optional test fixture.

Optional accessories

9261 Test Fixture
 9143 Pincher Probe

Note

Measurement frequency, measurement signal level and measurement range are limited when using the 9143 Pincher Probe.

Measurement Range and Accuracy

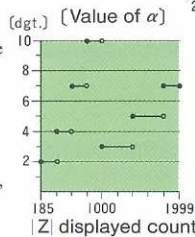
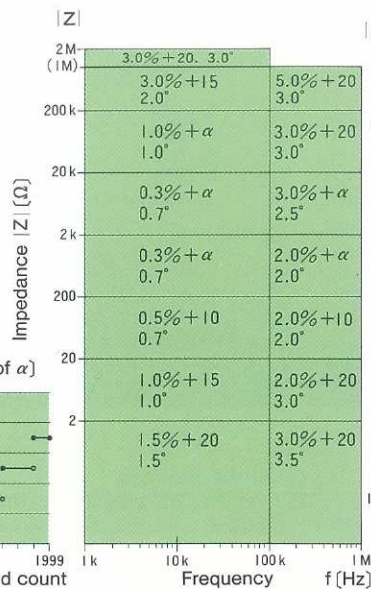
Temperature and humidity 23 $^\circ$ C $\pm 5^\circ$ C, 80% RH max. (no condensation)

Time after power on 30 min. or over, Measurement signal level 1 Vrms, Test fixture 9261

Accuracy is specified for directly-corrected frequency readings after zero adjustment under the above conditions (directly-corrected frequencies: 1k, 2k, 4k, 10k, 20k, and 40 kHz, and in 50 kHz intervals from 100 kHz to 1 MHz, for a total of 25 points. Other frequencies are corrected by interpolation).

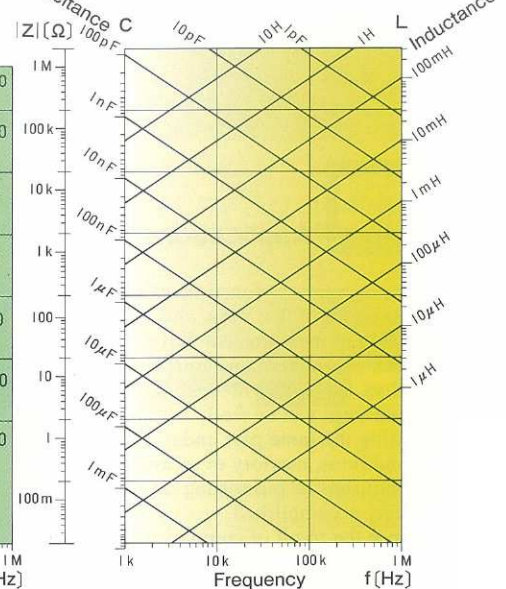
1. $|Z|-\theta$

Measurement range, Accuracy table



Top: Accuracy of |Z| \pm (%rdg. + dgt.)
 Bottom: Accuracy of θ \pm deg. α is displayed as |Z| count

C,L \rightarrow |Z| conversion table



Note) For frequencies corrected by interpolation, the $|Z|-\theta$ accuracy value in the table should be multiplied by 2. Range and accuracy depend on the measurement signal level.

2. R, ESR, G

Measurement Range

Same as $|Z|$ (the number of digits for G depends on the measurement frequency and the measurement range).

Accuracy

Supposing that $Q \leq 0.1$ ($D \geq 10$, $\theta \leq 5.71^\circ$), the $|Z|$ accuracy as calculated below is applied.

R: $|Z| = R$, ESR, G: $|Z| = ESR = 1/G$

3. C, L, X, B

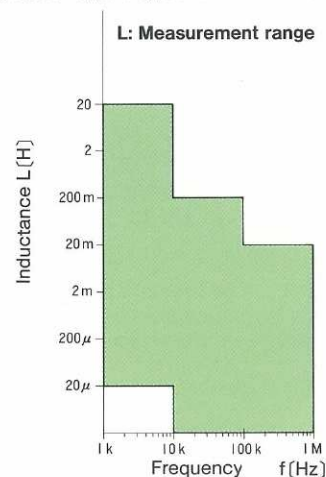
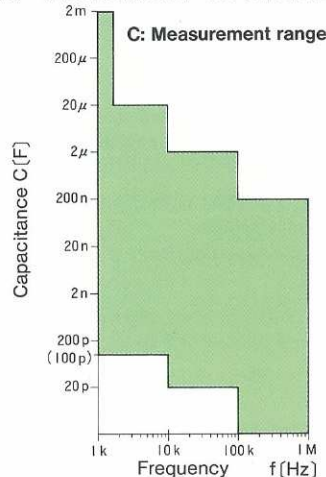
Measurement Range

For C and L, refer to the table below. Measurement range for X and B is the same as $|Z|$ (the number of digits for B depends on the measurement frequency and the measurement range).

Accuracy

Supposing that $D \leq 0.1$ ($Q \geq 10$, $\theta \geq 84.29^\circ$), the $|Z|$ accuracy as calculated below is applied.

C: $|Z| = 1/(2\pi f|C|)$, L: $|Z| = 2\pi f|L|$, X, B: $|Z| = X = 1/B$ (X is $X = 1/(2\pi fC)$, $X = 2\pi fL$ and B is calculated as $1/X$)



4. D, Q

Measurement Range

D: 0.0001 to 3.0000

Q: 0.1 to 1000 (Q is calculated as $1/D$)

Accuracy

The θ accuracy calculated as $\theta = \tan^{-1}(1/D) = \tan^{-1}(Q)$ is applied to D and Q.

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