
# PRECISION COMPONENT ANALYZER 3260B

## Product Specification

## Issue A

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# 1 3260B SPECIFICATION

## 1.1 Measurement Functions

Any of the following parameters may be measured and displayed.

### 1.1.1 Impedance Mode

DC Resistance

AC Parameters

Series or Parallel Equivalent Circuit: C+R, C+D, C+Q, L+R, L+D, L+Q

Polar Form: Z + angle

### 1.1.2 Handler Mode

DC Resistance

AC Parameters

Series or Parallel Equivalent Circuit: C+R, C+D, C+Q, L+R, L+D, L+Q

Polar Form: Z + angle

### 1.1.3 Transformer Mode

DC Resistance:

Primary or Secondary Windings.

AC Parameters:

Primary L+Q

Primary Leakage Inductance

Secondary Leakage Inductance

Interwinding Capacitance (Pri-Sec)

Turns Ratio:

Np/Ns, Ns/Np and Ns with Np entered before measurement.

### 1.1.4 Resonanance Mode

Frequency, L, R and Q for series or parallel circuits.

Results may be extrapolated if resonance is not found within frequency range specified.

### 1.1.5 Demagnetisation Mode

Enables a component to be demagnetized.

### 1.1.6 Insulation Mode (Option)

Pri-Sec, Pri-Gnd, Sec-Gnd.

### 1.1.7 Binning Mode

L + Q (Pri)
L + R (Pri)
L + R (Sec)
C + D (Pri)
Z + θ (Pri)
Ns/Np (Sec)
Leakage L (Pri)
Leakage L (Sec)
Cs-p (Sec-Pri)
Rdc (Pri)
Rdc (Sec)
Ns (Sec)
Ins (Pri-Sec)—requires Insulation Option
Ins(Pri-GND)—requires Insulation Option
Ins(Sec-GND)—requires Insulation Option

### 1.1.8 Sequence Mode

L + Q (Pri)
L + R (Pri)
L + R (Sec)
C + D (Pri)
Z + θ (Pri)
Ns/Np (Sec)
Ns (Sec)
Leakage L (Pri)
Leakage L (Sec)
Cs-p (Sec-Pri)
Rdc (Pri), Rdc (Sec)
Ins (Pri-Sec)—requires Insulation Option
Ins(Pri-GND)—requires Insulation Option
Ins(Sec-GND)—requires Insulation Option

### 1.1.9 LF Telecom (Option)

Simple Insertion and Return Loss (derived)

Damped Insertion and Return Loss (derived)

## 1.2 Additional Measurement Facilities

### 1.2.1 2/4 Terminal

Measurements may be made in two- or four-terminal mode, with selection via a front panel key.

### 1.2.2 Transformer Ratio Correction

Ratio measurement correction is available for normal or auto transformers to improve accuracy when winding resistance is high.

### 1.2.3 Low Magnetization Measurement

Any AC measurement may be made using a low magnetization measurement option. Measurements made will be slower than normal but changes to the characteristics of the device under test, due to magnetization, will be minimized.

### 1.2.4 Measurement Speeds

Four selectable speeds for all measurement functions. Selecting slower measurement speeds increases reading resolution and reduces measurement noise by averaging.

### 1.2.5 Repeat Measurement

Measurements may be made in single-shot or repetitive measurement modes, selected using a front panel key.

### 1.2.6 Frequency Steps

Coarse or fine frequency steps are available.

## 1.3 Test Conditions

### 1.3.1 Measurement Range

R 0.01mΩ to >2GΩ *

L 0.1nH to >1000H *

C 5fF to >1F *

* Varies with measurement speed

### 1.3.2 Frequency (AC Measurements)

Accuracy of selected frequency ±0.01%.

Coarse step mode: 20, 25, 30, 40, 50, 60, 80, 100, 120, 150, 200 repeated in each decade.

Fine step mode: >1800 frequencies between 20Hz and 3MHz with increments ≤1% over entire range.

### 1.3.3 Drive Level

Source impedance: 50Ω

1mV to 10V rms into open circuit

50μA to 200mA rms into short circuit

ALC ensures level at DUT is ±2%, ±1mV of set voltage or ±2% ±0.1mA of set current

### 1.3.4 DC Bias Current (Impedance modes only)

1mA to 1A from internal DC bias supply over the full temperature range.

Accuracy of set current ±2% ±0.25mA

Voltage compliance 20V minimum.

Safety interlock provision.

### 1.3.5 Insulation (Option)

Selectable test voltages of 100, 200 or 500V DC.

For user safety, short circuit current is limited to <2mA.

Test voltage accuracy: ±1%.

### 1.3.6 LF Telecom (Option)

| | |
|---|---|
| Frequency Range: | 100Hz to 20kHz |
| Drive Level Setting: | -28dBm to +16dBm (0.1dBm steps) |
| Line Impedance (Zo): | 50Ω to 2000Ω |
| Secondary Termination: | 50Ω to 2000Ω |
| Damping Components: | 4 digit accuracy |

## 1.4 Basic Accuracy

The following applies for medium or slow speeds, drive level 1V or 20mA.

Accuracy reduces for lower drive levels, or frequencies outside the quoted range.

At fast speed the same accuracy applies, except at 100Hz or for component values within 10:1 of the range limits quoted.

### 1.4.1 Rdc

0.2Ω to 500kΩ 0.5%

### 1.4.2 L, R, Z, C

Refer to the accuracy chart

### 1.4.3 Dissipation Factor (D)

$\pm A_d (1 + D^2)$ where $A_d$ = (% accuracy)/100.

Varies with frequency and option chosen

### 1.4.4 Quality Factor (Q)

$A_L (Q + 1/Q)$ where $A_L$ = measurement accuracy.

Varies with frequency and option chosen

### 1.4.5 Insulation (Option)

For leakage currents 0.5µA to 1mA ±5%

Corresponding resistance range at 500V = 500kΩ to 1GΩ

### 1.4.6 Insertion Loss (LF Telecom Option)

0 to 3dB ±0.1dB

3 to 6dB ±0.2dB

### 1.4.7 Return Loss (LF Telecom Option)

Specification applies if both Zo and Rt ≥150Ω.

Return loss accuracy is not guaranteed above 10kHz.

Uncertainties are doubled for Zo or Rt values down to 50Ω.

Frequency Range 200Hz to 5KHz

0 to 40dB ±1dB

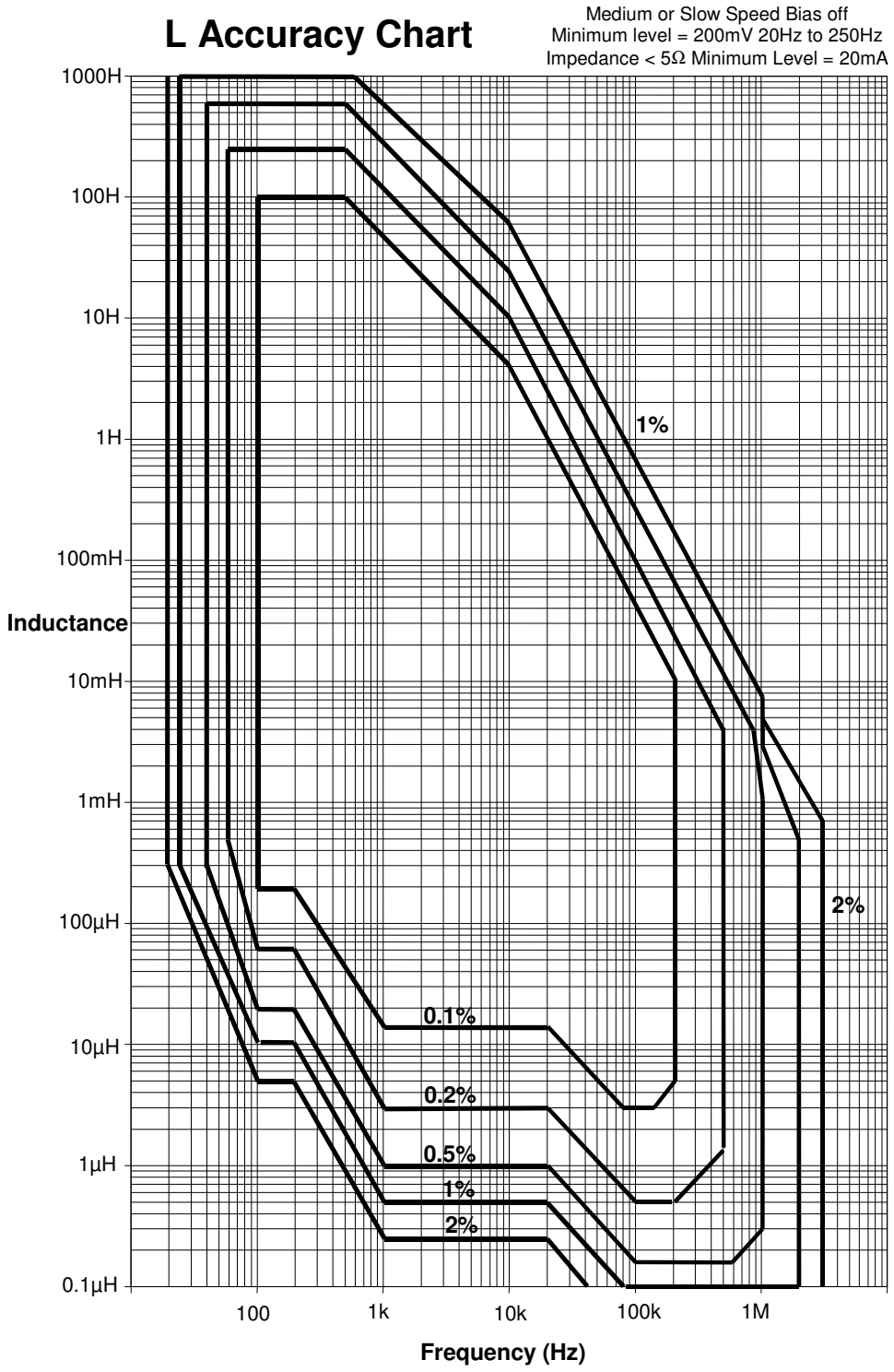
Up to 45dB ±2dB

Up to 50dB ±3dB

Frequency Range 100 to 200Hz, or 5kHz to 10kHz

0 to 35dB ±2dB

### 1.4.8 Accuracy Chart



## 1.5 General Data

### 1.5.1 Power Supply

| | |
|---|---|
| Input Voltage | 115V AC ±10% or 230V AC ±10% (selectable) |
| Frequency | 50/60Hz |
| VA rating | 100VA |
| Input fuse rating | 115V operation: 2AT |
| | 230V operation: 1AT |
| | The input fuse is in the fuse holder drawer integral to the IEC input connector. |

### 1.5.2 Display

High contrast black and white LCD module 320 x 240 dot with CFL back lighting and manual contrast control. Visible area 115 x 86mm. Viewing angle 45°.

### 1.5.3 Measurement Connections

8 front panel BNC sockets.

Selectable 2- or 4-wire (Kelvin) measurements with screen at ground potential.

Separate terminals for primary and secondary connections.

Indication of active sockets.

### 1.5.4 Remote Control (Option)

Designed to GPIB (IEEE 488.2) and SCPI 1992.0.

### 1.5.5 Binning Interface (Option)

25-way D-type connector on rear panel provides dedicated output lines for each bin, with busy and data ready handshake lines, separate pass/fail output that operates with the bar graph function, and a trigger input. Outputs are 0 to 5V nominal with ≥10mA current sinking capability. Trigger input is via contact closure or a negative logic edge (logic high = 4 to 5V).

### 1.5.6 Printer Output

Centronics parallel printer port on rear panel allows printing of test conditions, measurement results and graphical display.

### 1.5.7 Environmental Conditions

This equipment is intended for indoor use only in a non-explosive, non-corrosive atmosphere.

**Installation Category**

II (in accordance with IEC664)

**Temperature Range**

| | |
|---|---|
| Storage | -40°C to +70°C |
| Operating | 0°C to 40°C |
| Full Accuracy | 15°C to 35°C |

**Relative Humidity**

Up to 80% non-condensing.

**Pollution Degree**

2 (mainly non-conductive)

**Altitude**

Up to 2000m

### 1.5.8 Safety

Designed to meet the requirements of EN61010-1.

### 1.5.9 EMC

Complies with EN50081-1, EN50082-1 generic emissions and immunity standards by meeting with the requirements of EN55022, IEC801.2, EN801.3 & IEC 801.

### 1.5.10 Mechanical

| | |
|---|---|
| Height | 150mm (6") |
| Width | 440mm (17⅜") |
| Depth | 520mm (20½") |
| Weight | 11kg (24lb 4oz) |

### 1.5.11 Accessories Supplied

AC power cable 2m.
User Manual.

### 1.5.12 Options and Accessories

# 2 THEORY REFERENCE

## 2.1 Abbreviations

| | | | |
|---|---|---|---|
| B | Susceptance (= 1/X) | R | Resistance |
| C | Capacitance | X | Reactance |
| D | Dissipation factor (tan δ) | Y | Admittance (= 1/Z) |
| E | Voltage | Z | Impedance |
| G | Conductance (= 1/R) | ω | 2π x frequency |
| I | Current | | |
| L | Inductance | Subscript s ($_s$) = series | |
| Q | Quality (magnification) factor | Subscript p ($_p$) = parallel | |

## 2.2 Formulae

$$Z = \frac{E}{I} \qquad \text{(all terms complex)}$$

$$Y = \frac{I}{E} = \frac{1}{Z}$$

$$Z_s = R + jX = R + j\omega L = R - \frac{j}{\omega C}$$

$$|Z_s| = \sqrt{(R^2 + X^2)}$$

$$|Z_p| = \frac{RX}{\sqrt{(R^2 + X^2)}}$$

$$Y_p = G + jB = G + j\omega C = G - \frac{j}{\omega L}$$

$$|Y_p| = \sqrt{(G^2 + B^2)}$$

$$|Y_s| = \frac{GB}{\sqrt{(G^2 + B^2)}}$$

where $X_L = \omega L$ $X_C = \frac{1}{\omega C}$ $B_C = \omega C$ $B_L = \frac{1}{\omega L}$

$$Q = \frac{\omega L_S}{R_S} = \frac{1}{\omega C_S R_S} \qquad \text{(series R, L, C values)}$$

$$Q = \frac{R_P}{\omega L_P} = \omega C_P R_P \qquad \text{(parallel R, L, C values}$$

$$D = \frac{G_P}{\omega C_P} = \omega L_P G_P \qquad \text{(parallel G, L, C values)}$$

$$D = \frac{R_S}{\omega L_S} = \omega C_S R_S \qquad \text{(series R, L, C values)}$$

Note : The value $Q = \frac{1}{D}$ is constant regardless of series/parallel convention

## 2.3 Series/Parallel Conversions

$$R_S = \frac{R_P}{(1+Q^2)} \qquad R_P = R_S(1+Q^2)$$

$$C_S = C_P(1+D^2) \qquad C_P = \frac{C_S}{(1+D^2)}$$

$$L_S = \frac{L_P}{\left(1+\frac{1}{Q^2}\right)} \qquad L_P = L_S\left(1+\frac{1}{Q^2}\right)$$

Conversions using the above formulae will be valid only at the test frequency.

## 2.4 Polar Derivations

$$R_S = |Z|\cos\theta \qquad G_P = |Y|\cos\theta$$

$$X_S = |Z|\sin\theta \qquad B_P = |Y|\sin\theta$$

Note that, by convention, +ve angle indicates an inductive impedance or capacitive admittance.

If capacitance is measured as inductance, the L value will be –ve.

If inductance is measured as capacitance, the C value will be –ve.

$D = \tan\delta$ where $\delta = (90 - \theta)^\circ$ admittance measurement.

$Q = \frac{1}{\tan\delta}$ where $\delta = (90 - \theta)^\circ$ impedance measurement.