Notices

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Step-by-Step Easy Operations

Agilent 4263B  100 Hz to 100 kHz LCR Meter
Transformer Measurement
Table of Contents

1. Fundamental measurement procedures
2. Transformer Measurement
3. Appendix
The fundamental measurement procedures of the Agilent 4263B are shown in this slide.

1. Fixture Connection
The appropriate fixture is selected and connected to the instrument.

2. Measurement Condition Setting
The measurement conditions of the instrument, such as frequency, test signal level, and measurement parameter, are set.

3. Error Compensation
In this step, stray admittance and residual impedance are eliminated by the open and short corrections. Phase error is compensated with the cable length correction.

4. DUT Connection
The DUT is connected to the fixture.

5. Measurement & Analysis
After obtaining measurement results, they are processed and/or analyzed in this step.
Transformer Measurement

Test Fixture:
16060A transformer test fixture

DUT:
Transformer (Turns Ratio = 1:8)
Agilent P/N: 9100-4288

The 16060A transformer test fixture is recommended for measuring a transformer.
In this example, we measure a transformer whose turns ratio is 1:8 and nominal inductance of the secondary coil is 330 \( \mu \text{H} \).
Transformer Measurement

Step 1. Fixture Connection

1) Connect the 16060A to the UNKNOWN terminals
2) Connect 4 alligator-clip-leads to the 16060A
3) Set A:B switch to “1:N”

The first step is fixture connection.
1) Connect the fixture to the UNKNOWN terminals and turn the levers clockwise.
2) Connect the two black alligator clip leads furnished with the 16060A to the “COMMON” of the 16060A, and connect the two red alligator clip leads to “A” and “B”.
3) Set the “A:B” switch on the 16060A to the “1:N” position.
   For detail on A:B switch setting, see the appendix.
Transformer Measurement

Step 2. Measurement Condition Setting

The second step is measurement condition setting. Set the measurement conditions by using the following key strokes.

<table>
<thead>
<tr>
<th>Setting Condition</th>
<th>Value</th>
<th>Key Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset</td>
<td>-</td>
<td>![Blue], [. / Reset], --&gt; 'Yes'--&gt; [Enter]</td>
</tr>
<tr>
<td>1 Meas. Parameter</td>
<td>L2-N</td>
<td>![Meas Prmtr]--&gt;'L2'--&gt;[Enter]--&gt;'N'--&gt;[Enter]</td>
</tr>
<tr>
<td>2 Frequency</td>
<td>1 kHz</td>
<td>![Freq] --&gt; '10kHz' --&gt; [Enter]</td>
</tr>
<tr>
<td>3 Meas. Range</td>
<td>AUTO</td>
<td>![AUTO/ HOLD] (until Hold Range annunciator turns off)</td>
</tr>
<tr>
<td>4 Signal Level</td>
<td>1Vrms</td>
<td>![Level], [1], [Enter]</td>
</tr>
</tbody>
</table>
Transformer Measurement

Step 3. Error Compensation

1) Open compensation
   (a) Connect black clips and then connect red clips
   (b) Perform open correction

2) Short-offset elimination by ?MODE
   (a) Short the four clips
   (b) Perform ?MODE measurement

Do not use Short correction function with 16060A

The third step is error compensation.
Since the measurement configuration is not a four-terminal pair but a two-terminal configuration, the usual short correction cannot be used.
The short offset elimination is performed by ?MODE measurement.
Perform the error compensation by using the following key strokes.

<table>
<thead>
<tr>
<th>Setting Condition</th>
<th>Value</th>
<th>Key Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Compensation</td>
<td>Open</td>
<td>[Blue], [4/Open]--&gt;'OpenMeas'--&gt;[Enter]</td>
</tr>
<tr>
<td>2 Deviation Mode</td>
<td>Short</td>
<td>[Blue], [MeasPrmtr/Delta Mode]--&gt;'Delta RefEnt'--&gt;[Enter]</td>
</tr>
<tr>
<td>Step1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deviation Mode</td>
<td>Short</td>
<td>[Trig], [Enter] for primary parameter</td>
</tr>
<tr>
<td>Step2</td>
<td></td>
<td>[Trig], [Enter] for secondary parameter</td>
</tr>
<tr>
<td>Deviation Mode</td>
<td>Short</td>
<td>Pri'---&gt;[Enter]--&gt;'Delta ABS'--&gt;[Enter], [Enter]</td>
</tr>
<tr>
<td>Step3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The fourth step is DUT connection.

1) The coil that has more turns is identified as the secondary side, and the coil that has fewer turns is the primary side.

2) Connect the black alligator clips to the common of the transformer.

3) Connect the red alligator clip of “A” to the primary side of the transformer.

4) Connect the red alligator clip of “B” to the secondary side that has a larger inductance than that of the primary side.

When disconnecting the clips, reverse the procedure above (disconnect “B” first).

**Warning**

Terminal B is connected to terminal Hcur when switch A:B is set to 1:N. While terminal Hcur of the 4263B is connected to a terminal of the transformer, high-voltage induction may occur at the other terminals.
Transformer Measurement

Step 5. Measurement and Analysis

L2: self inductance (measured with 2-terminal configuration) and N:turns ratio

\[ L2: +360.09\, \text{H}, \quad N: +8.039 \]

\[ \text{FREQ: 10kHz, LVL: 1000mV} \]

L2: self inductance and M mutual inductance

\[ L2: +360.09\, \text{H}, \quad M: +45.54\, \text{H} \]

\[ \text{FREQ: 10kHz, LVL: 1000mV} \]

L2: self inductance and R2 DC resistance

\[ L2: +360.09\, \text{H}, \quad R2: +277.61\, \text{mH} \]

\[ \text{FREQ: 10kHz, LVL: 1000mV} \]

The last step is measurement and analysis. The measurement result is shown on the LCD.

Here, the measurement result of “L2” self inductance measured with the 2-terminal configuration and “N” turns ratio is shown on the LCD. If you need more accurate inductance measurement, measure it with the 4-terminal configuration using a 4TP fixture, such as the 16089E.

By using the following key strokes, the “M” mutual inductance and “R2” DC resistance of the secondary coil can be measured.

<table>
<thead>
<tr>
<th>Setting Condition</th>
<th>Value</th>
<th>Key Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Meas. Parameter</td>
<td>L2-M</td>
<td>[Meas Prmtr]--&gt;'L2'---&gt;[Enter]--&gt;'M'---&gt;[Enter]</td>
</tr>
<tr>
<td>or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Meas. Parameter</td>
<td>L2-R2</td>
<td>[Meas Prmtr]--&gt;'L2'---&gt;[Enter]--&gt;'R2'---&gt;[Enter]</td>
</tr>
<tr>
<td>2 Deviation Mode</td>
<td>Short</td>
<td>[Blue], [MeasPrmtr/ Delta Mode]-&gt;'Pri'---&gt;[Enter]-&gt;'Delta ABS'---&gt;[Enter], [Enter]</td>
</tr>
</tbody>
</table>

Note: L2 and R2 means that they are measured with the 2-terminal configuration. Please do not confuse “L2” with “self-inductance of secondary coil.”
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This slide shows a simplified circuit of the 16060A.
- B terminal of the 16060A is connected to Hc of the 4263B.
- A terminal of the 16060A is connected to Hp of the 4263B.
- Com terminals of the 16060A are shorted by each other in the 16060A and connected to Lc and Lp of the 4263B.

The 4263B can only measure at N?1. Therefore, to measure N, connect the transformer side with more turns to the Hc terminal.

This configuration is not a four-terminal pair but a two-terminal. Therefore, the accuracy is not as precise as that of the four-terminal pair configuration. For more precise measurement, use the four-terminal pair configuration.
# Appendix

## How to Use A:B Switch of 16060A

<table>
<thead>
<tr>
<th>Switch Position</th>
<th>Measurement Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L2</td>
</tr>
<tr>
<td>1:N</td>
<td>Self inductance of transformer winding connected to “B”</td>
</tr>
<tr>
<td>N:1</td>
<td>Self inductance of transformer winding connected to “A”</td>
</tr>
</tbody>
</table>

1: $n_a$ is the number of turns in the winding connected to “A”, $n_b$ is the number of turns in the winding connected to “B”.

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Operation Examples

Thank you very much