

Selecting Circuit Mode of Inductance via LCR Meter

When measuring an inductor via LCR meter, what is the best circuit mode, Ls or Lp?

The following guideline (based upon the expected impedance of the Inductor should be applied for selecting the circuit mode:

For $|Z| \geq 10k$ Ohms, use the parallel circuit mode (Lp);

For $|Z| \leq 10$ Ohms, use series circuit mode (Ls);

For $10 \text{ Ohms} < |Z| < 10K \text{ Ohms}$, follow the manufacturer's recommendations (if available).

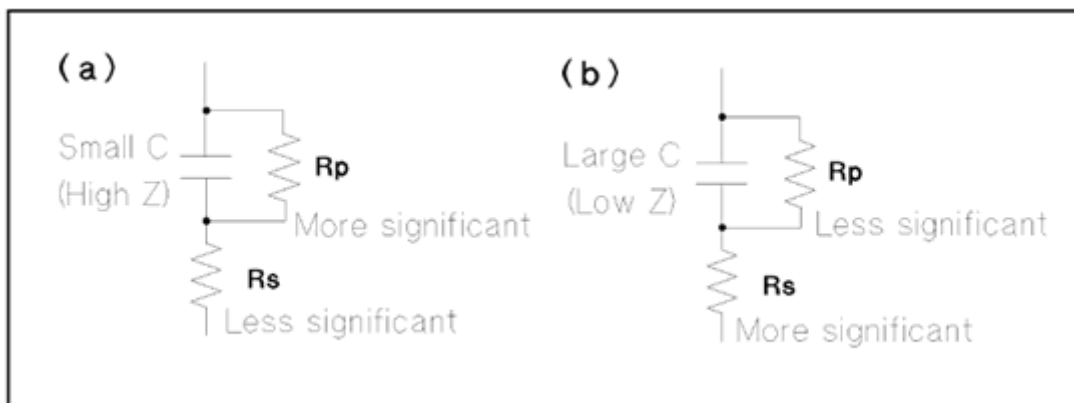
$$|Z_L| = \omega L = 2\pi f L \quad (f \text{ in Hz, } L \text{ in H, } |Z_L| \text{ in Ohms})$$

For example, $L=10\mu\text{H}$ $f=100\text{kHz}$,

$$|Z_L| = 2 * 3.14 * 1000 * 10^{-6} * 100 * 1000 = 628 \text{ Ohms} < 10k \text{ Ohms, use the parallel circuit mode (Ls);}$$

Additional Details:

To measure L, C, or R, there are two equivalent circuit models. The LCR meter can select the mode by setting the FUNC (function) to Cp, Cs, Lp or Ls. To determine which mode is best, consider the relative impedance magnitude of the reactance, Rs and Rp.



Large Inductance (modeled by (a) in above figure).

When the measurement involves a large Inductance (high impedance), Rs has relatively more significance than Rp. The parallel circuit mode (Lp-D or Lp-Q) should be utilized.

Small Inductance (modeled by (b) in above figure).

Small Inductance yields small reactance which implies that the effect of the parallel resistance (Rp) has relatively more significance than that of series resistance (Rs). The low value of resistance represented by Rs has negligible significance compared with the inductive reactance so the series circuit mode (Ls-D or Ls-G) should be used.

Note that the same concepts apply to capacitor measurement as well.