

Selecting Circuit Mode of Capacitance via LCR Meter

When measuring a capacitor via LCR meter, what is the best circuit mode, Cs or Cp?

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

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

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

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

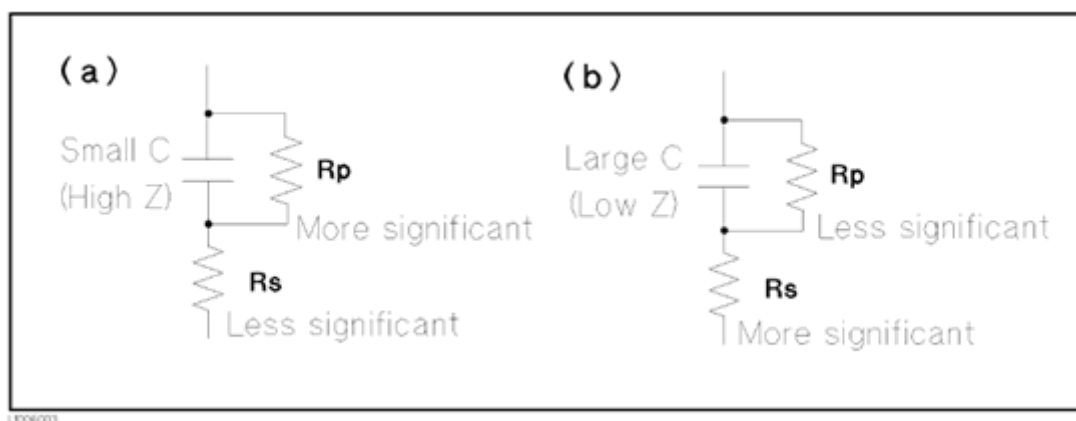
$$|Z_c| = 1 / \omega C = 1 / 2 \pi f C \quad (f \text{ in Hz, } C \text{ in F, } |Z_c| \text{ in Ohms)}$$

For example, $C = 1000 \mu\text{F}$ $f = 1 \text{ kHz}$,

$$|Z_c| = 1 / 2 \pi \cdot 3.14 \cdot 1000 \cdot 1000 \cdot 10^{-12} = 159 \text{ kOhms} > 10 \text{ k Ohms, use the parallel circuit mode (Cp);}$$

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.



Small Capacitance (modeled by (a) in above figure).

Small capacitance yields large reactance which implies that the effect of the parallel resistance (R_p) has relatively more significance than that of series resistance (R_s). The low value of resistance represented by R_s has negligible significance compared with the capacitive reactance so the parallel circuit mode (Cp-D or Cp-G) should be used.

Large Capacitance (modeled by (b) in above figure).

When the measurement involves a large capacitance (low impedance), R_s has relatively more significance than R_p . The series circuit mode (Cs-D or Cs-Q) should be utilized.

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