ENERGY:

The energy available for discharge is expressed in joules, and is calculated as:

$$\text{joules (watt-seconds)} = \frac{CV^2}{2}$$

where C = capacitance (microfarads—μf)

V = peak d-c charging voltage (kilovolts—KV)

The capacitance and the dissipation factor of standard units are measured on a General Radio 1611A bridge or equivalent at a frequency of 60 cycles per second and referred to a temperature of 25°C.

The voltage rating of each unit is the peak d-c voltage to which the capacitors are to be charged. The charging time is not to exceed two minutes with a maximum of one minute at full charge before being discharged.

INDUCTANCE:

The equivalent series inductance (ESL) depends on the mechanical construction of the capacitor. An extremely low value of inductance is mandatory where high values of peak current at high ringing frequencies are required.

Sangamo has developed the mechanical design, component parts, and manufacturing techniques which allow the fabrication of high voltage, energy discharge capacitors with very low values of equivalent series inductance.

The equivalent series inductance of standard Sangamo Type EDC capacitors is measured by the standing wave method as outlined below.

1. STANDING WAVE METHOD
   (a) Drive the capacitor with a constant current variable frequency source.
   (b) Connect a VTVM across the terminals of the capacitor.
   (c) Scan frequency spectrum, recording minimum voltage.
   (d) Calculate the equivalent series inductance from resonant frequency.

There are other established methods of determining the equivalent series inductance of a capacitor. Two of these are outlined below:

2. DISCHARGE METHOD
   (a) Simulate a low energy discharge with a known low inductive load.
   (b) Determine the resonant frequency from an oscilloscope.
   (c) Calculate the total circuit inductance from the resonant frequency.
   (d) Deduct the external inductance of the known inductive load.
3. GRID-DIP METHOD
   (a) Place a shorting strap between the insulated terminal and the case terminal.
   (b) Determine the resonant frequency from a grid-dip meter.
   (c) Calculate the total circuit inductance from the resonant frequency.
   (d) Deduct the external inductance of the shorting strap.

RESISTANCE:

The equivalent series resistance (ESR) depends on the mechanical construction of the capacitor as well as the choice of the composite dielectric, and is also dependent on the circuit ringing frequency.

The ESR affects the percentage of voltage reversal and the damping factor. The ESR is interrelated with the dissipation factor and the capacitor Q and is calculated as: