

# Dielectric Test System with DC Bias

## Protecting LCR Meter when sample breakdown



**Nonlinear Dielectric:** when measuring capacitance (dielectric constant) with commercial LCR meters or analyzers (such as Agilent/Keysight 4284A, E4980A, 4294A), the applied voltage is only around 1 V.

However, many piezoelectric ceramics (PZT) and polymers (PVDF) have non-linear response to applied electric field. Usually, their dielectric constant and dissipation factor become lower at high voltage.

In many applications such as capacitors and actuators, the dielectric layer is operated at high electric field  $>10 \text{ V}/\mu\text{m}$  or  $>100 \text{ V}/\mu\text{m}$ , and their effective dielectric constant and  $\tan\delta$  are significantly different from the values measured with regular LCR meters or impedance analyzers with 1 Vrms.

Directly applying a high voltage to samples during dielectric test has the risk to fail the expensive LCR meter if the test sample experiences sudden dielectric breakdown at high test voltage and temperature.

**PolyK PK-HVC1801 Functions:** Protect the expensive LCR meter/analyzers when the test samples experience dielectric breakdown during dielectric test under high DC bias ( $\pm 4000 \text{ V}$ ).

### Specifications

1. Maximal voltage:  $\pm 5000 \text{ V}$
2. Maximal current:  $\pm 10 \text{ A}$
3. Frequency range: 20 Hz to 1 MHz
4. Sample Cp: 10 pF to 100 mF
5. Temperature:  $-184$  to  $600^\circ \text{C}$
6. Safety interlock between test fixture and high voltage amplifier

### Main Components

1. PK-HVC10000 Protection & Control System with HVHT Test Fixture
2. Test control software and laptop computer
3. Trek Model 5/80 amplifier ( $\pm 5 \text{ kV}$ , 80 mA)
4. Agilent or Keysight Precision LCR Meter
5. Temperature chamber with liquid nitrogen cooling ( $-184 \text{ C}$  to  $600 \text{ C}$ ) and high voltage safety interlock.
6. All connection HV and communication cables.

### Control Software

