

Instructions

Radiant Technologies High Temperature Test Fixture

Title: Instructions for the use of the High Temperature Test Fixture and Associated Cables

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Summary:

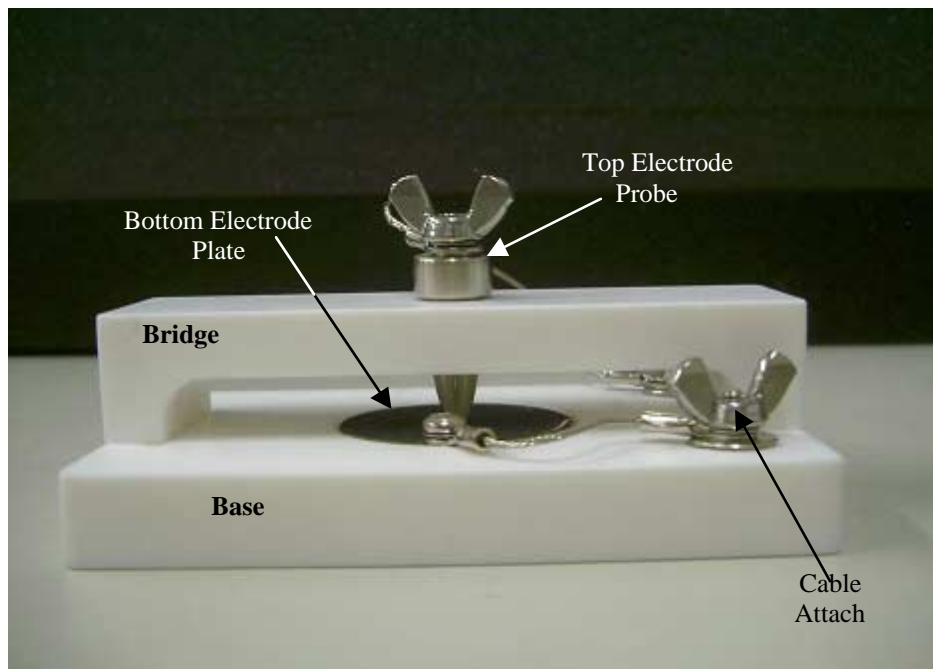
Radiant's High Temperature Test Fixture (HTTF) allows the testing of bulk ceramic capacitors at temperatures up to 520°C and 3000 Volts in a muffle furnace or tube furnace. The fixture is constructed to allow easy loading of the sample but to also prevent stress cracking in the fixture at high temperatures. The test fixture is constructed of MACOR™, a Dow-Corning machinable glass ceramic. MACOR™ is rated up to 1000°C. The bottom electrode plate and the top electrode gravity contact are constructed from Nickel 200, a high temperature electrical conductor. Nickel 200 has a melting point of 1435°C. The electrical attachment hardware are constructed of 14-4 stainless steel. (The stainless steel will discolor with high temperature.)

The high temperature, high voltage cables delivered with the HTTF are constructed from high temperature spark ignitor cable. The cables have a center lead of nickel wire, layers of mica tape and Nextel™ insulators, and an outer sleeve of nickel braid. The cables are rated to 20KV for spark applications. However, characterization equipment for ceramic capacitors is very sensitive to parasitic leakage. The spark ignitor cable is not suitable for use above 3000V because of parasitic leakage. The cables are rated for use in temperatures up to 520°C. The cable has no asbestos insulation in it.

Instructions and Limitations for the High Temperature Test Fixture:

The High Temperature Test Fixture is constructed of a glass ceramic. The fixture consists of five parts:

1. The base.
2. The bottom electrode plate.
3. The top electrode probe.
4. The bridge.
5. Cable attachment points.



The top electrode contact bridge is designed to sit in slots in the fixture base with no mechanical attachment points. This prevents stress build-up due to expansion of the bridge and base during changes in temperature. The bottom electrode plate sits in a well in the fixture base. The sample rests on the plate. The bridge guides the top electrode probe so that it rests directly on the top contact of the sample during testing. The top and bottom electrode contacts are connected to the cable attach points using ring terminals. The cables also end with ring terminals.



To use the sample holder:

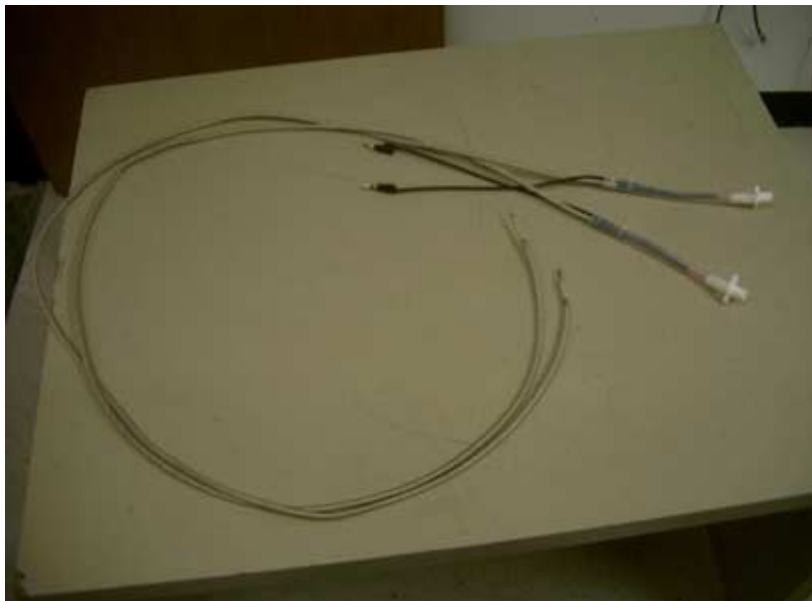
1. Place the ring terminals of the high temperature, high voltage cables on the attach points with their associated contacts and tighten the wing nuts.
2. Place the sample on the bottom plate.
3. Fit the legs of the bridge into the slots on the base.
4. Put the top contact probe through the hole in the bridge so that it contacts the top electrode of the sample.
5. If you are using a muffle furnace, place the sample holder in the center of the muffle furnace.
6. If you are using a tube furnace, place the sample holder onto the lip of the tube and let it equalize with the tube furnace. Then, slide the sample holder into the tube.

Limitations for the High Temperature Test Fixture:

- 1. The HTTF is essentially glass and will fracture if dropped. Handle with care.**
- 2. The sample holder is capable of operating at up to 1000°C in air. However, it is not capable of handling temperature shock. Avoid rapid temperature changes. Limit the temperature ramp rate to 10°C/minute or slower going up or down.**
- 3. Do not place the sample holder directly into a hot oven or furnace. Place the sample holder into the furnace or oven at room temperature and then increase the temperature to the desired test temperature using a 10°C/min or slower ramp rate.**
- 4. The HTTF has a very high heat capacity. Let the sample holder and sample stabilize at the test temperature for at least half an hour prior to testing to ensure both have reached the test temperature. By the same measure, the HTTF will retain heat for hours during cool down. Allow the HTTF to cool completely after a test before handling it.**
- 5. Do not place a hot HTTF on a cool surface or the HTTF will crack.**

Instructions and Limitations for the High Temperature, High Voltage Cables:

The cables consist of 20KV Spark Ignitor cable from Thermal Wire and Cable Corporation. The cable is rated to 534°C but we recommend staying below 520°C.



The cable consists of center nickel wire, mica tape, Nextel™ heat barrier, and a nickel braid outer sheath. (The insulation has no asbestos in it.) The cable has been modified to put a high temperature ring terminal on one end. The ring terminal is separated from the end of the nickel braid by about an inch to prevent air breakdown between the two. The mica tape has been whipped with nickel wire to prevent it from unraveling. The nickel braid has a nickel crimp clamp on it for the same reason.



On the other end, the spark ignitor cable merges with Radiant's standard 10KV room temperature cable. An additional complication occurs because of the outer nickel braid. The most likely path for a short is through the insulation from the center conductor to the outer braid. The outer braid will then be at the high voltage, a potential safety hazard since the cable is likely to be handled during use. Consequently, there are banana plugs attached to the braid. **As a safety precaution, the banana plugs must be connected to the system ground when the cables are in use.** The Radiant testers all have green banana sockets on their rear panels that are connected directly to earth ground. It is important that the tester be connected to a three-prong power plug with an earth ground connection.



To use the high temperature, high voltage cables:

1. Place the ring terminals of the high temperature, high voltage cables on the attach points of the High Temperature Test Fixture and tighten the wing nuts.
2. Use the standard 10KV cable provided with your test system to connect the low temperature high voltage connectors on the low temperature end of the cables to the HV DRIVE and HV RETURN sockets on the Precision HVI.
3. **Connect the two black banana plugs to the earth ground connection on the rear of the Precision tester or HVI.**
4. Do not allow the low temperature insulation or rubber sleeve on the low temperature ends of the cables to go into the furnace. They will melt.

Limitations for the High Temperature High Voltage Cables:

1. **Do not exceed 3000V during testing.**
2. **Do not exceed 520°C.**
3. **Do not touch the nickel braid on the outer portion of the cables during a high voltage test.**
4. **Be careful at the end of a test to make sure that the cable has cooled before handling it with your hands.**