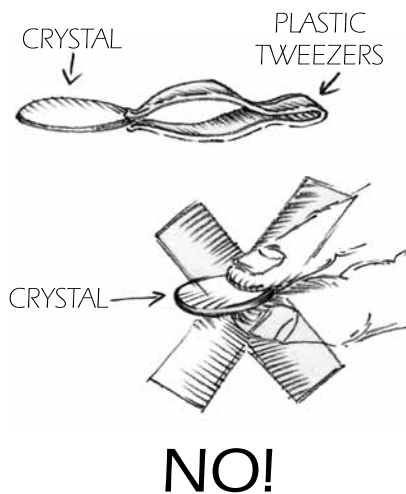


## Basic Care and Handling of Quartz Crystals

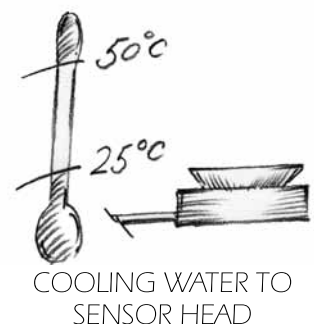
A quartz crystal is arguably one of the most sensitive electrical devices ever invented. When used for thin film coating measurements, a crystal can detect as little as a picogram or 0.000000000001 gram of deposited material. This corresponds to a coating layer on the order of one atom thick! Quartz is also sensitive to heat, able to respond to temperature changes of less than one-one hundredth of a degree. Furthermore, quartz crystals are sensitive to stress, able to detect the movement when films cool after being deposited on the crystal during a typical optical coating run.

With a device this sensitive operating in high stress coating environments you have to ask, "How can it work?" Our answer is, "Just barely!" A typical antireflective coating with magnesium fluoride, zirconium, or chromium hits the crystal doubly hard with high temperatures in excess of 300 degrees C and high stresses from the film as it cools only the crystal. It is not uncommon to see a crystal act erratically by exhibiting large positive and negative jumps in rate or thickness, after just a few minutes exposure to MgF<sub>2</sub>. These materials can also easily destroy a crystal.



Therefore, in order to get the maximum life out of Fil-Tech's quartz crystals, we recommend the following guidelines:

- 1) Always use plastic tweezers around the edge of the crystal during handling. Do not touch the center of a crystal, as any oil, dirt, dust or scratches will quickly degrade the ability of the crystal to vibrate.
- 2) Keep the crystal holder clean. Do not allow flakes of material to come into contact with the center of the crystal, front or back. Any burrs or particulate that come between the crystal and cap will interfere with the electrical contact and develop stress points, affecting the crystal's vibrational pattern.
- 3) If possible after it is mounted in the cap, blow off the crystal surface with a low-pressure jet of dry, filtered nitrogen or oil-free air. This will remove any dust or flakes of loose coating that may have come in contact with the crystal during installation.
- 4) In order to promote better film adhesion, maintain the cooling water to the sensor head in the 25 to 50 degree C range. The hotter the deposition, the closer the crystal should run to 50 degrees C. Additionally, whatever your temperature, keeping it stable to within 1-2 degrees will give superior results.



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