CURRENT COMPENSATED QUARTZ CRYSTAL MICROBALANCE

General considerations

The program works together with the power oscillator. This oscillator provides a very high current in the vibrating quartz placed in air or vacuum, up to 100 mA (RMS). Such a current provides a very high acceleration on the surface of the vibrating quartz. This is important for investigating fundamental laws in physics and for interesting experiments in material science and biotechnology.

When the current through an AT-cut quartz crystal resonator is increased, a parabolic increase in frequency is recorded. The effect is known as “amplitude-frequency effect”.

If a film of a foreign material is deposited on the surface of a quartz crystal, the inertial field associated with the high acceleration of the shear vibration will induce a sedimentation of the deposited film particles, while the out-of-plane vibrations, which are simultaneously present on the crystal surface, will develop an acceleration normal to the crystal surface. This acceleration will induce a force which can break the bonding between film particles and the surface.

The concept of the program is similar to that of the “Thermocompensated QCM”, but instead of sweeping the temperature, in “Current compensated QCM” the current through the vibrating quartz is swept between 0.5 mA and 100 mA. A RF transformer is used as a current sensor. Using this program it is possible to cancel the amplitude-frequency effect and to perform reliable measurements.

More details about the use of the program are provided in the description of the previous programs.