OVERVIEW

Statek has designed and manufactured quartz-crystal resonators using photolithographic and chemical milling methods for over five decades and has applied this expertise and capability to now offer double-ended tuning-fork (DETF) force-sensors, as shown in Figure 1.

The resonant frequency of the DETF force-sensor is a function of its dimensions, electrode configuration, and the applied force. Compression or extension of the sensor causes a corresponding change in frequency, as shown in Figure 2. Once calibrated, measuring this change in frequency gives the applied force.

Because the DETF force-sensors operate on frequency-based priniciples, they are immune to amplitude noise as well as noise at frequencies other than at the frequency of the sensor. As a consequence, the signals in the system can operate at full amplitude, thereby avoiding the noise that usually plagues low-level measurements.

Quartz force-sensors offer further advantages over other force sensing technologies such as sensitivity, small size, low mass and stable performance.

We can customize the size of the sensor to fit your application.

FEATURES

- Highly sensitive to applied force
- Small size
- Operates based on frequency principles
- High signal-to-noise-ratio
- Low aging
- Designed for customer specific applications

APPLICATIONS

- Accelerometers, see Figure 3.
- Pressure sensors, see Figure 4.

TECHNICAL PAPERS

Chuang, Shih S., *Force Sensor Using Double-Ended Tuning Fork Quartz Crystals*, Proceedings of the 37th Annual Frequency Control Symposium, 1983, pp. 248-254.

FURTHER INFORMATION

We invite you to discuss your custom force sensing requirements with us. Call us at (714) 639-7810, or e-mail sales@statek.com.
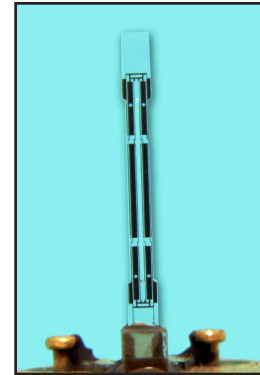

Figure 1: A picture of one of Statek's DETF Force-Sensors

$$dF/F = \alpha P + \beta P^2$$
$$\alpha = 124 \text{ ppm/gram}$$
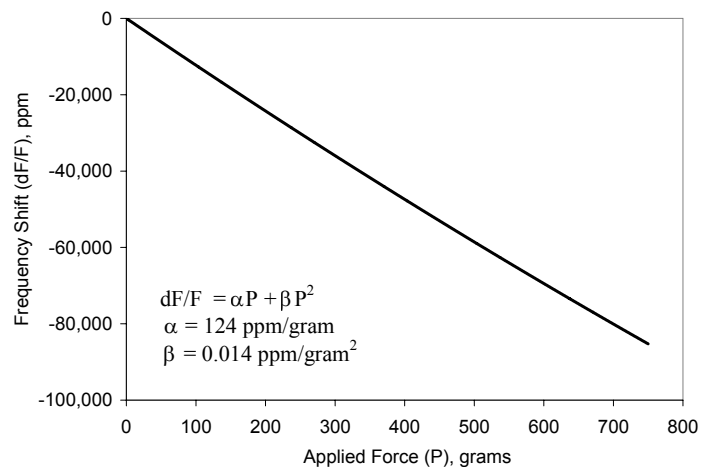$$\beta = 0.014 \text{ ppm/gram}^2$$

Figure 2: Example of a corresponding change in frequency by applied force.
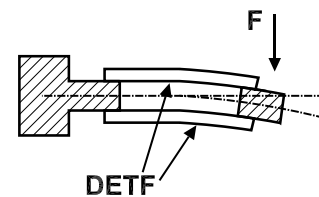

Figure 3: Cross-section of one type of accelerometer. Acceleration is determined by frequency differance between two crystals.
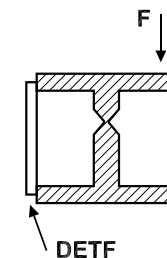

Figure 4: Schematic of pressure sensor or scale. Applied force is proportional to frequency shift.

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