

# Quartz Crystals



Quartz crystal is critical to coating thickness monitoring. Gredmann provides two types of gold crystals :

A ) Physical Characteristics	Gredmann GM-3952
Sensor Materials	single crystal $\alpha$ quartz
Angle of Cut	35 degree 15' ( AT )
Counter	3 diopter Plano-Convex
Surface	10 micron
Diameter	12.45mm
Electrode	99.99+% Gold/Cr
B ) Electrical Characteristics	
Resonant ( MHz )	4.994-5.006
Resistance at resonance	<15 Ohm
Contact resistance	<15 Ohm

A ) Physical Characteristics	Gredmann GM-8010
Sensor Materials	single crystal $\alpha$ quartz
Angle of Cut	35 degree 15' ( AT )
Counter	3 diopter Plano-Convex
Surface	10 micron
Diameter	13.97mm
Electrode	99.99+% Gold/Cr
B ) Electrical Characteristics	
Resonant ( MHz )	5.980-5.995
Resistance at resonance	<15 Ohm
Contact resistance	<20 Ohm

## Quartz Crystal

### Working Principle :

The quartz monitor crystal is a crucial component of a quartz crystal based measurement and control system. The crystal enables precise and repeatable thin film depositions for a wide variety of high end uses. Quartz materials will develop an electrical charge like a battery, when pressed or squeezed. This property is called the piezoelectric effect ("pea-a-zo"). Conversely, if a battery were connected to a crystal, the crystal would change shape by stretching or compressing. If the battery were then turned on and off quickly in rapid succession, the crystal would vibrate. Depositing a thin coating on the crystal's surface will slow down the vibration of a quartz crystal. The crystal vibrates at approximately 6 million times per second (or 6 Megahertz), given a real time measurement of the thickness of coating being deposited on the crystal or any object in its vicinity. As the coating deposits on the crystal, the monitor counts the change in the number of vibrations per second and calculates the thickness of the coating from the data it receives.

### Application :

Gold quartz crystal, with low contact resistance, very high chemical stability and easy to deposit, can be used for low-stress metal deposition such as gold, silver and copper.

### Basic Care :

- 1) Always use plastic tweezers around the edge of the crystal during handling. Do not touch the center of a quartz 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) After the crystal is mounted in the cap, if possible, 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 20 to 40 degree centigrade range. The hotter the deposition, the closer the crystal should run to 40 degrees centigrade. Additionally, whatever your temperature, keeping it stable to within 1-2 degrees will give superior results.

**Gredmann Group**

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## Quartz Crystal

### Storage Condition :

- 1) Temperature : Standard room temperature between 20 and 24 degrees C.
- 2) Humidity : Standard room humidity between 40% and 60%.
- 3) Chemical Exposure : Do not store crystals in the presence of volatile materials, oils, sulfur, halides, ozone, iodine and oxidizing agents.
- 4) Particulate Exposure : Do not store crystals in particulate laden environments. Seal containers properly.
- 5) Mechanical Exposure : Do not store crystals in areas with excessive mechanical vibrations.