The QCM200 Quartz Crystal Microbalance measures mass and viscosity in processes occurring at or near surfaces, or within thin films. This system include a controller, crystal oscillator electronics, crystal holder, three quartz crystals, and Windows/Mac software.

The instrument reads the resonant frequency and resistance of a 5 MHz, AT-cut quartz crystal. The resonant frequency changes as a linear function of the mass of material deposited on the crystal surface. The resistance at resonance changes with the viscosity / elasticity of the material (film or liquid) in contact with the crystal surface.

As a gravimetric instrument, the QCM200 can measure mass ranging from micrograms to fractions of a nanogram. Detection limits correspond to submonolayers of atoms. Observations of conformational changes, such as phase transitions, swelling, and cross-linking, can easily be made.

Specifically designed to handle heavy loads (up to 5 kΩ), the instrument will maintain oscillation in aqueous solutions containing over 88 % glycerol (w/w %). It is ideal for studies involving lossy films and highly viscous liquids.

The QCM200 is a stand-alone instrument with a built-in frequency counter and resistance meter. Series resonance frequency and resistance are measured and displayed, and there is an analog output proportional to frequency which can
An optional axial flow cell adapter attaches to the standard crystal holder. This provides an easy way of interfacing the QCM to a flow injection analysis system.

**EQCM**

For EQCM applications, an analog output proportional to frequency shift may be directly connected to a potentiostat or galvanostat. Only the front-surface electrode of the crystal is exposed to the solution. This electrode is also transformer isolated, as required for EQCM operation.

The figure below illustrates a typical EQCM experiment. The frequency analog output of the QCM controller is connected to the potentiostat A/D input. The potentiostat digitizes the voltage, and its software displays relative frequency changes synchronous with the electrochemical data. The versatile QCM200 can be easily integrated into any custom 5 MHz crystal based EQCM setup.

**In the Lab**

The QCM200 is a valuable research tool for applications ranging from pure surface science to biochemistry. Quartz crystals can be pre-coated with any thin-film material including organic polymers, hydrogels, composites, ceramics, biomolecules, bacteria and living cells. This provides unlimited potential for the development of novel gas and biological sensors.
QCM200 Quartz Crystal Microbalance

The quartz crystal microbalance is an essential addition to any biological laboratory. The data from a QCM perfectly complements that obtained from other techniques, such as surface plasmon resonance (SPR) and atomic force microscopy (AFM), aiding in the analysis of complex biological interactions.

QCM200 Software

A Windows/Mac software program is included to facilitate remote operation and simplify data acquisition.

Applications

- Immunosensors
- Sorption sensors
- Moisture analyzers
- Particulate monitors
- Contamination monitors
- Electrovalency measurements
- Hydrogen absorption on metal films
- Bubble formation
- Redox and conductive polymer research
- Double-layer characterization
- Corrosion studies
- Surface oxidation
- DNA and RNA hybridization studies
- Antigen-antibody reactions
- Protein adsorption
- Detection of virus capsids, bacteria, mammalian cells
- Biofouling and antifouling
- Biomembranes and biomaterials
- Protein-protein interactions
- Self-assembled monolayers (SAMs)
- Molecularly imprinted polymers (MIPs)
- Langmuir/Langmuir-Blodgett films
- Laser ablation, desorption and breakdown studies
- MEMS nanomaterials
- Intelligent biomaterials
**Ordering Information**

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<tr>
<th>Part</th>
<th>Description</th>
<th>Price</th>
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<td>QCM200</td>
<td>Controller, oscillator, 3 crystals,</td>
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<td>holder and software</td>
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**QCM200 Specifications**

### Frequency Measurement

- **Display resolution**: 0.01 Hz (10 second gate), 0.1 Hz (1 second gate), 1.0 Hz (0.1 second gate)
- **Gate time**: 0.1 s, 1 s, 10 s, user-selectable
- **Int. timebase stability**: \(<2 \times 10^{-6}\) Allan Variance (typ.)
- **Int. timebase accuracy**: ±1.5 ppm
- **Analog output**
  - Δf output: ±10 V full scale (20-bit)
  - Ranges: ±200 kHz, ±100 kHz, ±50 kHz, ±20 kHz, ±10 kHz, ±5 kHz, ±2 kHz
- **Frequency output**
  - Frequency: 5 MHz (nominal)
  - Level: TTL (square wave)
- **Ext. timebase input**
  - Frequency: 10 MHz
  - Level: 1 Vpp (nominal)

### Resistance Measurement

- **Resistance display**
  - **Range**: 0 to 5000Ω
  - **Resolution**: 5 digits:
    - 0.001Ω for R<100Ω
    - 0.01Ω for 100Ω≤R<1000Ω
    - 0.1Ω for 1000Ω≤R<5000Ω

- **Conductance output (Vc)**
  - Resistance: R=10,000×(10^(-5))–75Ω
  - Resistance range: 0 to 5000Ω
  - Voltage level: 0 to 10.625 VDC, log scale
  - Impedance: 1 kΩ

### Capacitance Cancellation

- **Range**: 10 pF to 40 pF (20 pF nominal)
- **Limit**: 0.01 pF

### Quartz Crystals (polished)

- **Frequency**: 5 MHz, AT-cut, plano-plano
- **Diameter**: 1 inch
- **Electrodes**: Cr/Au (Ti/Au, Ti/Pt, In Sn oxide opt.)

### Physical

- **Analog connectors**: BNC
- **Interface**: RS-232, 9600 baud
- **Crystal holder Material**: Holder: Kynar®, O-ring: Viton®
- **Cable**: Cat-5, 3 ft.
- **Dimensions, weight**: 10.6" x 2" x 7" (WHD), 2 lbs.
- **Operating temperature**: 0°C to 40°C
- **Power**: 15 W, 100/120/220/240 VAC, 50/60 Hz
- **Warranty**: One year parts and labor on defects in materials and workmanship