

QCM100 Quartz Crystal Microbalance

- *Electronic oscillator design with automatic gain control circuit*
- *Simultaneous series resonance frequency and resistance outputs*
- *Simplified shunt capacitance cancellation*
- *Transformer isolated crystal face for EQCM measurements*
- *Compatible with highly loaded crystals (up to 5 k Ω) including viscous liquids and viscoelastic films*
- *No network or impedance analysis necessary*

The QCM100 is a highly accurate quartz crystal microbalance used for mass and viscosity measurements. It provides outputs related to the series resonance frequency and resistance of the crystal oscillator and it is specially designed to handle heavily loaded crystals (up to 5 k Ω) making it ideal for applications involving lossy films and highly viscous liquids.

The QCM100 comes complete with analog controller, crystal oscillator electronics, quartz crystal and holder. All you need is a frequency counter and a voltmeter to complete the QCM measurement setup. Replacement crystals, oscillator and crystal holders are also available.

The analog controller provides power to the crystal oscillator electronics and has outputs (BNCs) for frequency and

conductance. It also has a potentiometer for canceling shunt capacitance. Proper capacitance cancellation is required to assure true series resonance operation of the crystal oscillator, and eliminate frequency and resistance errors.

The QCM100's capacitance cancellation adjustment is extremely simple. There are no complicated tuning steps and no special tool requirements — just a single 10–turn pot and an LED display that shows you which way to turn the knob and when to stop. The achievable capacitance cancellation is 0.01pF — an order of magnitude better than competitive models.

The crystal oscillator electronics are designed around a unique automatic gain control (AGC) circuit instead of the traditional phase lock oscillator (PLO). The AGC provides the



quartz crystal resonator with the necessary gain to overcome viscoelastic losses and achieve series resonance, while providing a signal that monitors the energy dissipated by the sensor (i.e. related to the series resonance resistance). The crystal oscillator will reliably drive crystals with resistance up to 5 k Ω . For example, it will maintain oscillation in viscous aqueous solutions containing over 88 % glycerol (w/w %).

The QCM100 uses a 5 MHz, 1 inch diameter, AT-cut, quartz crystal. All quartz crystals are designed specifically for operation in liquids, and are available in a variety of electrode materials and finishes. The crystal holder is designed so that only the front electrode is exposed to the

gas or liquid under test, as required in EQCM experiments. A conductive metallic pad (wrap-around electrode) allows connection to the front electrode from the back of the crystal. This feature, combined with transformer isolation between the crystal electrodes and the oscillator circuit makes the QCM100 ideal for electrochemical research, and compatible with virtually all potentiostats.

The QCM100 offers improved measurement capabilities, simplified capacitance cancellation and better value than any other controller of its kind. For more details, please call us at 408-744-9040 or visit our website at www.thinkSRS.com.

Specifications

Frequency output

Frequency	5 MHz (nominal)
Level	TTL (square wave)
Source impedance	50 Ω
Connector	BNC

Conductance output (Vc)

Resistance calculation	$R = 10,000 \times (10^{-V_c/5}) - 75 \Omega$
Resistance range	0 to 5000 Ω
Voltage level	0 to 10.625 VDC, log scale
Impedance	1 k Ω
Connector	BNC

Capacitance cancellation

Range	10 to 40 pF (20 pF nominal)
Achievable cancellation	0.01 pF

Quartz crystals

Frequency	5 MHz, AT-cut, plano-plano
Diameter	1 inch
Electrodes	chromium/gold, titanium/gold, titanium/platinum (polished/unpolished)

Crystal holder

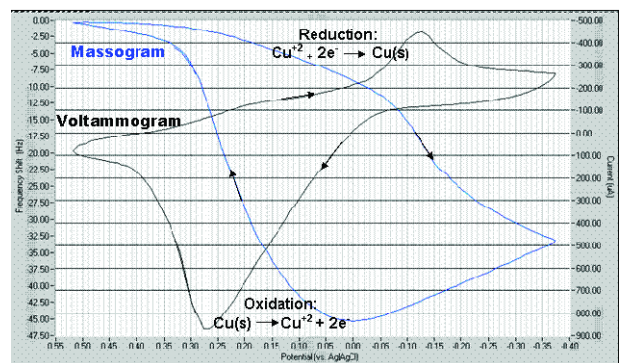
Material	Kynar
O-ring	Viton
Connector	BNC

Ordering Information

QCM100 Quartz Crystal Microbalance
(includes controller, crystal oscillator, holder and 3 chromium/gold crystals)

Replacement Accessories

Replacement crystals (qty. 10)
Replacement crystal oscillator electronics module
Replacement holder
Flow cell



1mM CuSO₄ in 0.1 M H₂SO₄

Cyclic voltammogram and massogram data for Cu deposition on a Au electrode. The frequency/potential diagram shows a frequency decrease with the deposition of Cu metal on the crystal's surface.



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