QCM-I

Quartz Crystal Microbalance with Impedance Analysis

The **QCM-I** is a high-sensitivity, mass sensing instrument, which probes the interactions of molecules, polymers and biological assemblies with surfaces, label-free and in real time. It can independently control the temperature over a wide range on different channels. The QCM-I can measure the hydrated mass and rigidity of nm to micron scale layers at the sensor surface, as well as fluid properties.

The measurement uses impedance analysis of a quartz crystal sensor to determine the resonant frequency and bandwidth of the resonant conductance curve; fundamental and overtones. The bandwidth or full width at half maximum (FWHM) is directly correlated to the well-known dissipation (D.)

Main features:

- 2 - 4 channel measurement
- Frequency and FWHM(dissipation) on fundamental and overtones up to 80 MHz
- Independent temperature and flow control on channels
- Temperature range from 4°C to 80°C (≤ ± 0.02 °C)
- Electrochemical measurement options
- Modular sensor-holders for different sensor sizes
- Adaptor for a variety of External Modules

QCM Sensors and Holders

- Quartz crystal sensors with Au, Pt or high quality ITO electrodes and a wide range of coatings. SiO_2, TiO_2, PDMS etc
- The modular sensor-holders can accept 14 mm or 1" diameter quartz crystals and other custom sizes.
- Electrochemical Flow-cell with a Pt-disc counter and leak-free Ag/AgCl reference electrode.
- External sensor-holder modules are available for a range of uses including: Pipette-filling, Immersion, Microscopy, Vacuum, High-pressure, Low-profile, etc.

Diameter 1"

Diameter 14 mm

Front Sensing Side

Back Side

Control & Measurement

The **BioSense** software is a fully-functioned application platform, common to the whole analytical instrument range. It provides full control of the **QCM-I** instrument, User accounts, data acquisition and display, storage and management, data processing and export. Addition of the electrochemical module incorporates control of the potentiostat and allows synchronized data acquisition.

Application Areas

- Biosensor Development
- Protein aggregation
- Biofilms / Surface fouling
- Lipid bilayers
- Cells
- Electropolymerisation
- Battery
- Coatings under industrial conditions: Vacuum, Dip, Inkjet printing
- Glove-box processing
- Layer by layer deposition
- and many more…….

Specification of QCM-I

Technical Information	QCM-I
Measurement Channels	2 (Upgradable to 4)
Frequency Range	0.05 – 80 MHz, up to the 13th overtone for a 5 MHz Crystal
Measurement Modes	Frequency Scan, Resonance Spectra, QCM(t), QCM(t)-EC, EC
Resonance Frequency sensitivity in Liquid	$\leq 2 \times 10^{-1}$ Hz
Dissipation Sensitivity in Liquid	$\leq 1 \times 10^{-7}$
Mass Sensitivity in Liquid *	≤ 1 ng/ cm^{-2}
Parameters Recorded for each Overtone	Resonance Curve, Frequency, ΔFrequency, FWHM, ΔFWHM, Q, Dissipation, ΔDissipation, Temperature, etc.
Temperature Control	
Thermal Zones	TWO, Independent Temperature Control
Working Temperature	4 ^{O}C to 80 ^{O}C with sample pre-equilibration on inlet
Temperature Stability	$\leq \pm 0.02$ ^{O}C
Temperature control	Set manually or via software
Fluidic and Sample	
Flow Cell Volume	~ 40 µl (typical with Ø14 mm crystals)
Wetted Parts	PEEK, Ti, SS, PFE, VITON (or Kalrez)
Sample Loading	Manual and Software Controlled Injection or Selector Valve
Pump	Peristaltic, Pulse-free, Independent Flow Control on each Channel
Other Sample Cell Options	Electrochemical flow-cell, Open Cuvette, Immersion, Vacuum, High-pressure, Remote Low-profile, Ellipsometry, Microscopy, Custom Design...
Physical Dimensions (without the computer)	
Dimensions, weight	450 mm x 260 mm x185 mm, 5.5kg
Software	
BioSense	Universal software platform for QCM & EC measurements
Import / Export of data	Export to third party software Excel, JPG, BPM, WMF etc.
PC Control	USB 2.0, Windows® 10
Electrical	
Power Supply	12VDC and 24VDC power supply with universal input voltage (100V-240V AC / 50-60 Hz)

* The Sauerbrey relation is assumed to be valid.

All specifications are subject to change without notice.