

QCM-I™ Compared To Other QCM Technologies

The following chart shows a comparison of technical parameters and features of the various QCM technologies, including MicroVacuum's QCM-I devices.

QCM Technology	MicroVacuum QCM-I (QCM with dissipation from impedance measurement)	QCM-D (QCM with dissipation from decay measurement)	QCM- R (QCM with resistance measurement)
Measurement principle	Impedance scan	Ring-down (resonance decay)	Resistance scan
Output parameters	f, FWHM*, D	f, D	f, R
Overtones measured	Yes (1-13)	Yes (3-13)	No (only 1)
Frequency sweep possibility	Yes (from 0.1 MHz to 80 MHz)	No	No
Viscoelastic modelling	Yes, if overtones are measured. Modelling software is a free add-on.	Yes, if overtones are measured.	No
Kinetic modelling	Yes. Modelling software is a free add-on.	No	No
Measurement of true crystal properties	Yes	Yes	Yes/No
Maximum mass sensitivity in liquid	~0.4 ng/cm² at 2 second acquisition rate	~0.5 ng/cm ² at 5 second acquisition rate	N/A
Maximum dissipation sensitivity in liquid	~0.02 x 10⁻⁶ at 2 second acquisition rate	~0.04 x 10 ⁻⁶ at 5 second acquisition rate	N/A
Applicable for	With overtones measured, it is applicable for various films, including thin and thick films, and also for rigid and/or viscoelastic films.	With overtones measured, it is applicable for various films, including thin and thick films, and also for rigid and/or viscoelastic films.	Suitable for rigid and thin films only.
Sensor size	Standard: dia 14mm Optional: other sizes	dia 14mm only	dia 1" only
Sensor frequency	Standard: 5 MHz Optional: Other frequencies (e.g. 3MHz, 9MHz, 10MHz)	5 MHz only	5 MHz only
External sensor holders	Many	Many	One

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Modularity	✓✓✓✓✓	✓✓✓	✓
Temperature control	Standard: +4°C to +80°C (+/- 0.01°C) Extreme: -40°C to +120°C	Standard: +15°C to +65°C (+/- 0.02°C)	N/A
Independent temperature control of channels	Yes	No	No temperature control available
High Pressure High Temperature	Yes, up to the limit of the pressure vessel	Yes	No
Number of channels	1, 2, 4 or unlimited channels with QCM-I Net	1, 4, 8	1
Network topology for scalable, parallel measurements	Yes, with QCM-I Net	No	No
3rd party device integration	Unlimited with Biosense API and digital I/O control	No	No
Digital I/O	Yes	No	No
Electro Chemistry Option	Yes	Yes	Yes
Dry and Wet Mass measurement	Integrated with MicroVacuum's OWLS optical system add-on	Only with purchase of costly 3rd party devices. (not fully integrated)	N/A
Price	\$\$\$	\$\$\$\$\$	\$\$

* The full width half maximum (FWHM) is the width of the resonant curve in Hz. For the change in viscosity of a liquid $\Delta FWHM / \Delta f = 2$. This makes changes in FWHM much easier to understand without modelling than dissipation D , despite both being in effect the same measurement.

Get the QCM-I Technical Specification and Pricing at Fil-Tech, Inc. at <https://www.filtech.com/contact-us/>