

VITROCELL® sQCM

Improved Sensor for High Precision Real-Time Dose Monitoring

The VITROCELL® sQCM 12 is the next step in the evolution of dosimetry methods in cell culture exposure systems. It simplifies the usage of conventional Quartz Crystal Microbalances suitable for VITROCELL® 12 modules while maintaining the working principle, precision and accuracy of the balances you're used to.

We have redesigned the entire sensor from scratch, enabling not only extremely high stability and exact measurements, but also eliminating the need for tools during service and cleaning for maximum user-friendliness.



sQCM mounted in VITROCELL® Cloud Alpha 12 module (left) and the new designed oscillator (right).

Performance, simplified

This novel solution minimizes the time you have to spend to perform cleaning and crystal exchange: it now only takes a mere minute. Eliminating the need for screwdrivers, our new design uses a bayonet catch to connect the individual sensor parts.

In Continuous Flow Systems, results are seen online, enabling you to measure cumulated depositions starting from 170 ng/cm² reliably. In Cloud systems, the sQCM 12 provides the additional benefit of real-time control over the process and exact readings after removal of humidity (dotted line on the right).

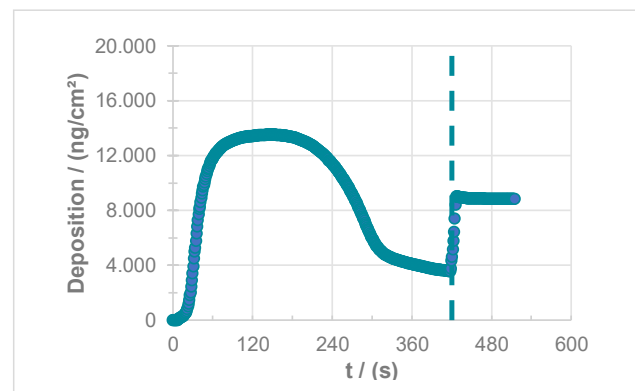


Wide Compatibility

The innovative sensor design is fully compatible with any VITROCELL® module for 12-well sized inserts, be it Cloud, Cloud Alpha, Continuous Flow or any other VITROCELL® exposure system for this insert size.

Use Case

Thanks to the wide compatibility of the sQCM 12 sensor, it is ideal for the validation of the mass deposition of exposure substances, either during or after an experiment. Its broad measuring range and shape reminiscent of a cell-culture insert make it a convenient aid in acquiring single exposure doses or complete dose-response curves.



VITROCELL® Cloud Alpha 12 – Exposure of 0.2 mL 0.015 mg/mL Fluorescein and 9.54 mg/mL KCl

sQCM Oscillator

To complement the handling and measurement advantages of the newly developed sensors, we paired it with a completely in-house designed oscillator.

Not only is it a handy device – measuring only 3.5 cm in height, length and depth and connected via USB-C to a laptop – but it is also more stable in terms of crystal oscillation and connectivity.

We have gone through the experimental process of tweaking the circuitry to have less sensitivity to viscous substances and therefore improving stability during active experiments. While response e.g. during active nebulization in a Cloud exposure system is therefore a bit different, the measurements have been validated to match results of previous QCM designs.

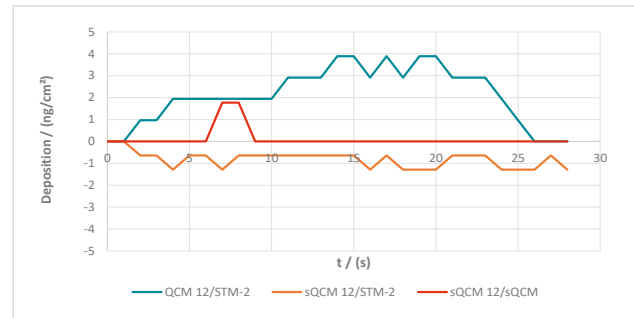
It is compatible to the sQCM 12 sensor, will be compatible to future developments and is ready to use with older QCM models via an adapter. A software update is required.

Retaining validation

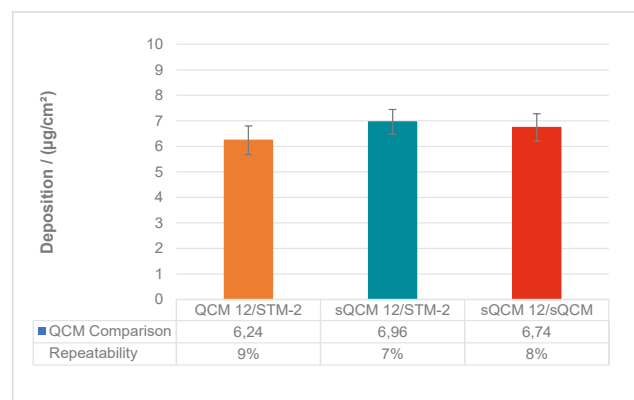
Establishing a new standard of user-friendliness for dosimetry tools, the sQCM 12 ensures the acquired data is comparable with results generated through previous generation QCMs and their oscillators.

We have run extensive tests to ensure the measured dose is virtually the same. Furthermore, the deposition on the crystal element itself has been increased, matching the dose on the inserts even better. On top of this, the sQCM 12 sensor reduces temperature sensitivity by almost a factor of 10 (17 Kelvin difference resulting in a 230 ng/cm² readout instead of 1500–2000 ng/cm² on the last generation sensor) and shows less jitter minimized to only 0.38 ng/cm² (1.46 ng/cm² on the previous model), reducing the detection limit to 1.13 ng/cm². These values have been calculated by the 3 σ variation of the sensor in an unloaded state. This lessens the sQCM 12 sensor’s role with regard to detection limit considerations, making the temperature stability of the exposure system the new restraining factor.

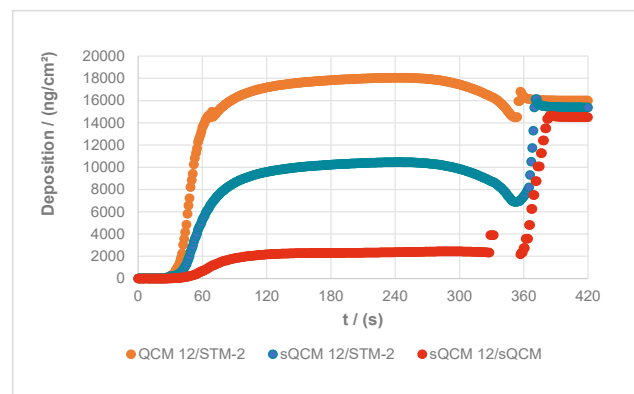
Repeatability of the measured deposition has been pushed even further below the 10 % deviation mark including the run-to-run variability of the exposure system.



VITROCELL® QCM – Unloaded state jitter



VITROCELL® Cloud Alpha 12 – Nebulization of 0.2 mL 1x DPBS, simultaneous exposure of QCM 12 and sQCM 12, 5-run-average



VITROCELL® Cloud Alpha 12 – Nebulization of 0.2 mL 1x DPBS, simultaneous exposure of QCM 12 and sQCM 12, exemplary run