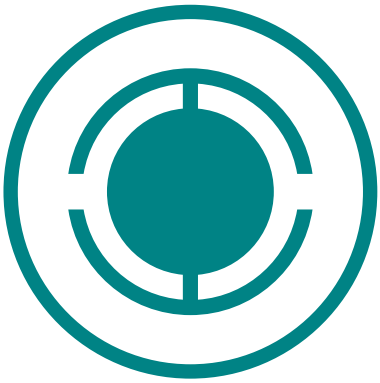


N

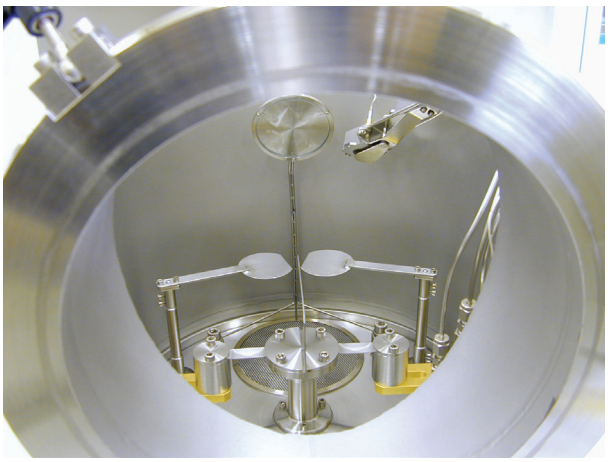
MATERIALS
THICKNESS MEASUREMENT

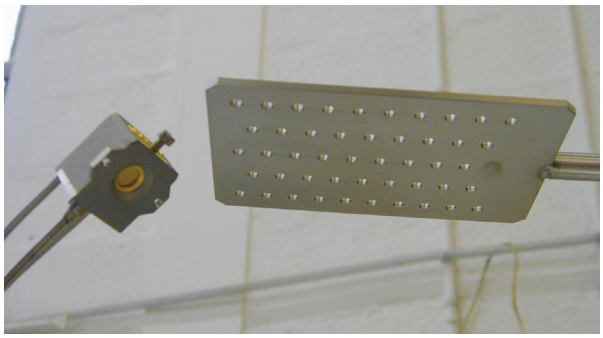
Quartz microbalance (QCM) are used to measure, in situ and in real time, the thickness of thin films during vacuum deposition.

PRINCIPLE OF USE

The measurement is based on the modification of oscillation frequency of the piezoelectric crystal due to mass overload. Thus, when a material thin film is deposited on the surface of a quartz crystal, its resonance frequency varies in a proportional way of the deposited layer mass/weight. We mainly use 5 MHz or 6 MHz AT-cut quartz. The 6 MHz quartz are dedicated to most recent deposition systems while the 5 MHz are typically used in BALZERS and equivalent evaporators.

The quartz probe has to be installed inside the vacuum chamber, close enough to the substrate where the deposition will be performed (refer to the picture below). Knowing the density of the layer, the thickness of the layer is then calculated in real time. Initial measurements as micro-weight (or nano-weight for very thin layers) or thickness on the substrate allow to pre-calibrate the system.

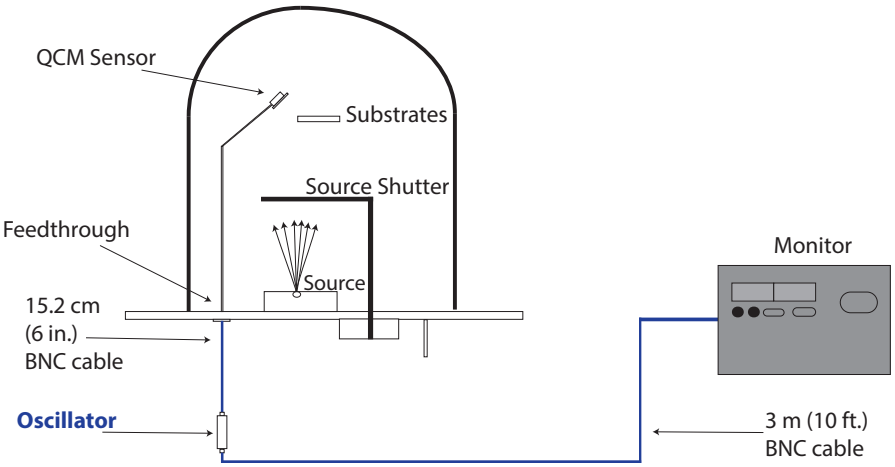




Neyco supplies two types of measurement chains by microbalance.

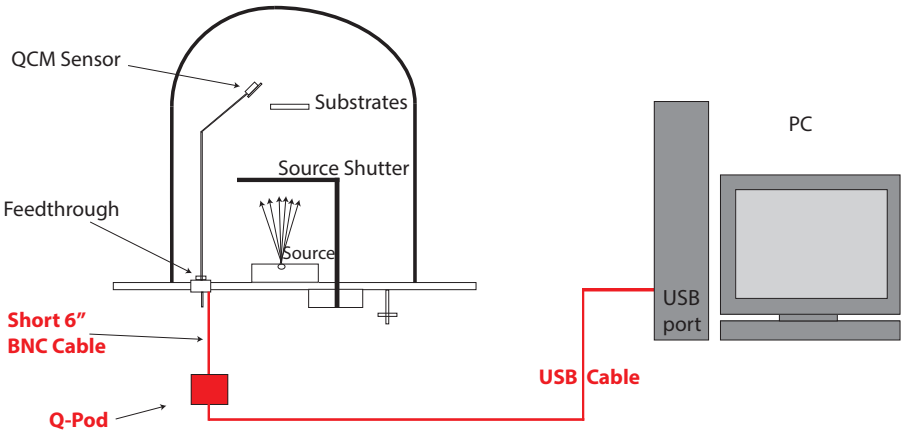
The standard one is Quartz Microbalance with Oscillator, including :

- 1 water-cooled quartz probe
- 1 watercooling feedthrough with 2 tubes + 1 coaxial cable to connect the quartz to the external oscillator
- 1 electrical oscillator mounted as close as possible to the vacuum feedthrough (thus to the quartz)
- 1 controller or monitor



The second system is the Quartz Microbalance (QCM) with a Q-pod (also known as QPOD and STM-2):

The Q-pod replaces both the oscillator and the monitor, and allows the data acquisition directly with the dedicated software.



Front Load Single/Dual Sensors

Front Load Single/Dual crystal sensors offer proven reliability and durability and have an excellent thermal stability. The front load design allows for easy insertion of the crystal holder in applications lacking sufficient room for side insertion.

Assembled mechanically rather than soldered, parts can be replaced conveniently in the field, if necessary. Sensors can be ordered individually or in a sensor/feedthrough combination that can be either welded or assembled with compression fittings.

Front load single sensor

FRONT LOAD SINGLE SENSOR CONFIGURATION

Two sensor configurations are offered: the standard version and the right angle (compact) version. The standard version is designed for installation from the side or bottom of the chamber having the cooling tubes parallel to the crystal face. The right angle version is designed for installation through the top of the vacuum system having the water cooling tubes perpendicular to the crystal face. Optionally, sensors can be ordered with a pneumatically driven crystal shutter to protect the crystal during source warm up, when not used during deposition of an alternate material, or to extend crystal life when used in sequential acquisition. The shutter is designed to flip down allowing easy crystal replacement.

FRONT LOAD DUAL SENSOR CONFIGURATION

The Front Load Dual Sensor is available in a standard mount configuration where the water tubes are parallel to the crystal face. A pneumatically driven crystal shutter comes standard to protect the back-up crystal, while the primary crystal monitors the deposition rate. The shutter is designed to flip down allowing easy crystal replacement.

For both Single and Dual Sensors, the exposed crystal electrode is fully grounded to effectively eliminate problems due to RF interference.

FEEDTHROUGHS

Neyco offers all types of feedthroughs: 1 inch bolt feedthrough, 2¾ inch (CF40) ConFlat® flange feedthrough and KF40 feedthroughs for the most popular.

FEEDTHROUGH CONNECTION

Front Load Single sensors can be ordered in combination with a feedthrough. The sensor / feedthrough connection can be either welded or made with compression fittings.

Compression fittings allow for easy adjustability without the need for brazing or welding. The feedthrough can be moved along the length of the tubes allowing the length inside the vacuum systems to be adjusted over a range of 20.3 to 121.9 cm (8 to 48 inches). Once the desired length is determined, the compression fittings allow for a finger tight tube seal. Alternately, a welded connection may be chosen. If a welded connection is desired, a sensor length specification form, must be completed prior to ordering and submitted with the order.

ADVANTAGES

- Front load crystal holder
- Easy installation
- Adjustable length if ordered with compression fittings
- Sensor/Feedthrough combinations available welded to customer specified lengths
- No brazing required if ordered with compression fittings or welded to feedthrough

SPECIFICATIONS

Maximum bakeout temperature with no water	130°C
Maximum operating isothermal environment temperature with minimum water flow	up to 400°C (according configurations)
Standard single sensor size	27 mm x 61.47 mm x 17.53 cm
Right angle single sensor size	28.19 mm x 26.92 mm x 26.92 mm
Dual sensor size	39.12 mm x 82.04 mm x 49.54 mm
Crystal exchange	Front loading; self-contained package for ease of exchange
Mounting	Two #4-40 tapped holes on the back of the sensor body
Crystal	0.550" (13.97 mm) diameter, 5 MHz or 6 MHz

Cool Drawer Single/Dual Sensors

The Cool Drawer™ Single/Dual Sensors allow crystal installation into the sensor from the side, convenient for systems with insufficient room for front load crystal installation.

The Cool Drawer™ Dual Sensor is designed for use in critical processes where it is desirable to have a second crystal in the vacuum chamber.

The sensors employ the Cool Drawer Crystal Holder which is thermally shielded by the water-cooled housing insuring excellent crystal performance.

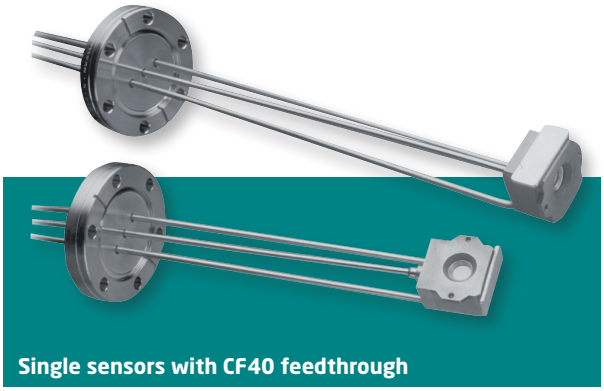
Single sensors with 2.54 cm (1") bolt feedthrough

ADVANTAGES

- No internal cables
- Cool Drawer crystal holder
- Easy installation
- Bakeable if ordered with welded CF40 flange
- Adjustable length if ordered with compression fittings
- No brazing required if ordered with compression fittings
- Sensor/Feedthrough combinations available welded to customer specified lengths

Available with:

- CF40 feedthrough
- 1" (2.54 cm) bolt feedthrough



Single sensors with CF40 feedthrough

SENSOR CONFIGURATIONS

Two sensor configurations are offered: the standard version and the right angle version. The standard version is designed for installation from the side or bottom of the

chamber and the cooling tubes and the crystal face are parallel. The right angle version is designed for installation through the top of the vacuum system and the water cooling tubes are perpendicular to the crystal face.

Single Sensor: both versions are available with or without a crystal shutter.

Dual Sensor: the sensor with the CF40 flange is pre-installed in a special two piece CF40 feedthrough. This allows the sensor head to be rotated independently of the flange and circumvents the dimensional limitations of the CF flange. Available with crystal shutter.

FEEDTHROUGH CONNECTIONS

Cool Drawer single sensors must be ordered in combination with a feedthrough. The sensor / feedthrough connection can be either welded or made with compression fittings.

Cool Drawer™ crystal holder

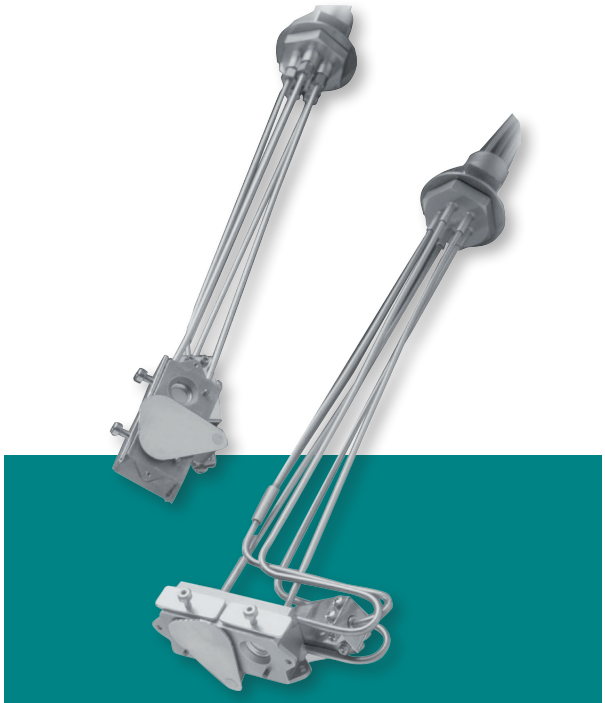
Compression fittings allow the easy adjustability without the need for brazing or welding. The feedthrough can be moved along the length of the tubes allowing the length inside the vacuum system to be adjusted over a range of 10 to 66 cm (4" to 26").

Once the desired length is determined, the compression fittings allow for a finger tight tube seal.

When selected with the welded CF40, the sensor is designed for high temperature processes where reliability is critical. Constructed of stainless steel and ceramic materials it is suitable for applications requiring high temperature bakeout (see specifications).

SPECIFICATIONS

Temperature (1 inch bolt)	Operational environment to 300°C with water cooling or 165°C without
Temperature (CF 40)	Operational environment to 450°C with water cooling or 165°C without
Crystal	Industry standard 0.550" (13.97 mm) diameter, 5 MHz or 6 MHz



Dual sensors with 2.54 cm (1") bolt feedthrough

Dual sensors with CF40 feedthrough

N

Sputtering Sensor

The Sputtering Sensor is specifically designed for use in any sputtering process. The sensor body and cooling tubes are Gold plated Beryllium Copper for maximum cooling efficiency in the sputtering environment.

A magnet built into the sensor head reduces excessive heating by energetic free electrons in sputtering systems by deflecting them with the external magnetic field.

The rear loading crystal holder design allows easy crystal replacement without having to remove the sensor head from the system.

Sputterring Sensor

FEEDTHROUGHS

Neyco offers two types of feedthroughs, either a 1 inch bolt and Ultra-Torr (compressing fitting) terminations or a CF40 welded terminations.

ADVANTAGES

- Gold plated Beryllium Copper sensor body and cooling tubes for maximum cooling efficiency
- Magnet to deflect free elctrons away from the monitor crystal
- Easy installation with bendable water tubes allowing flexibility in sensor placement
- Rear load crystal insertion for easy crystal replacement

SPECIFICATIONS

Maximum bakeout temperature with no water	105°C
Maximum operating isothermal environment temperature with minimum water flow	up to 400°C
Size (maximum envelope)	34.55 mm OD x 17.5 mm
Material	Au plated Be-Cu
Crystal exchange	Rear-loading
Crystal	0.550" (13.97 mm) diameter, 5 MHz or 6 MHz

CrystalSix® Sensor

The CrystalSix® Sensor is critical for long processes demanding continuous rate control. Whether an OLED, MBE, solar, long optical coating, or other processes having an extended period between chamber venting, the CrystalSix® sensor offers the security of 6 quartz monitor crystals in one sensor head. When used with a thin film controller, the CrystalSix® automatically rotates a new crystal into position whenever the current crystal fails or becomes unstable. Crystals are automatically replaced without interrupting your process for continued deposition rate monitoring.

Crystal indexing is accomplished with a pneumatically driven mechanism. This pneumatically driven motor provides better crystal thermal stability than competitive units using expensive in-vacuum, heat generating, electric motors. 1/8" water cooling tubes keep the sensor head thermally stable and allow flexibility in sensor placement.

When used with certain thin film controllers, the sensor provides position feedback so specific positions can be used with specific materials.

ADVANTAGES

- Hold six crystals with robust, automatic switching to maximize process uptime
- Stable crystal temperature, because crystal switching is pneumatically-driven
- 1/8" (3.2 mm) tubes maintain thermal stability and allow flexibility in sensor placement
- Optional crystal shutter available

CrystalSix®Sensor

SPECIFICATIONS

Maximum bakeout temperature without water	130°C
Maximum operating isothermal environment temperature with minimum water flow	up to 400°C
Size (maximum envelope)	97mm OD x 51 mm
Material	SS 304
Crystal exchange	Rear-loading
Crystal	0.550" (13.97 mm) diameter, 5 MHz or 6 MHz

Crystal 12® Sensor

The Crystal 12® sensor is critical for long processes demanding continuous rate control. Whether an OLED, MBE, Solar or other process having an extended period between venting, the Crystal 12® sensor offers the security of 12 quartz monitor crystals in one sensor head. When used with Cygnus 2, IC6, XTC/3M, XTC/3S, SQC-310C, the Crystal 12® automatically rotates a new crystal into position whenever the current crystal fails or become unstable. Crystals are automatically replaced without interrupting your process for continous deposition rate monitoring. To further minimize downtime, crystals can be preloaded into a second optional carousel, which can then be quickly and easily exchanged with the carousel containing the exhausted crystals, minimizing the time the system is open.

Crystal indexing is accomplished with a pneumatically driven mechanism. This pneumatic drive provides better thermal stability than competitive units using expensive in-vacuum, heat generating, electric motors. 1/8" (3.2 mm) water cooling tubes keep the sensor head thermally stable and allow flexibility in sensor placement.

When used with certain thin film controllers, the sensor provides position feedback so specific positions can be used with specific materials.

Crystal 12®Sensor

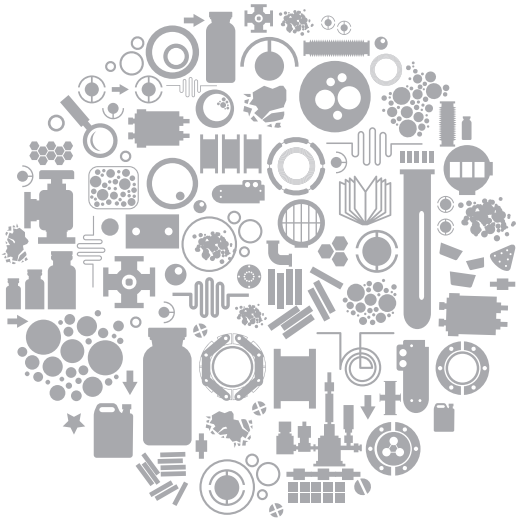
Crystal 12®Sensor

ADVANTAGES

- Hold 12 crystals with robust, automatic switching to maximize process uptime
- Easy-to-remove carousel allows fast replacement of all 12 crystals
- Stable crystal temperature, because crystal switching is pneumatically-driven
- Acommodate metric hardware
- 1/8" (3.2 mm) tubes maintain thermal stability and allow flexibility in sensor placement
- Easy-to-remove front deposition shield protects the crystals and carousel from material accumulation, minimizing the need to remove entire sensor for maintenance
- Optional mounting-post kit can be user-modified to accommodate metric hardware
- Optional crystal shutter available

SPECIFICATIONS

Maximum bakeout temperature without water	130°C
Maximum operating isothermal environment temperature with minimum water flow	300°C
Size (maximum envelope)	102 mm OD x 84 mm
Material	SS 304
Crystal exchange	Front-loading
Mounting	Six #4-40 tapped holes on the back of the sensor body, six #4-40 tapped holes outside circumference. Three #6-32 tapped holes with optional mounting kit
Crystal	0.550" (13.97 mm) diameter, 5 MHz or 6 MHz



neyco

30 avenue de la Paix
92170 Vanves - France
Tel: +33(0)1 41 90 50 50
Fax: +33(0)1 41 90 50 51

www.neyco.fr

Materials N 2018

neyco