QCM Research

Contamination and Outgassing Detection Products
for Laboratories and Aerospace

Introducing the

Mark 16

Cryogenic Quartz Crystal Microbalance

Overview

As the name implies, the Cryogenic Quartz Crystal Microbalances or CQCMs have the ability to detect gasses or contaminates successfully below the temperatures of liquid Nitrogen to 10K or -262°C. Most have an internal heater and optional temperature sensor which can be used for molecular flux measurement of gasses to or from crystal surfaces. The operator can set the heater to hold the crystals at temperatures below which the gasses condense in a vacuum environment. A piezoelectric quartz crystal will respond in a linear mass to frequency relationship as molecules condense on the sense crystal. The increased mass of the collected condensed gasses reduces the frequency at which the crystal resonates making it possible to calculate the amount or rate at which the gasses are collected. The electrical data from the piezoelectric crystal can be transmitted and is ideal for remote locations. During manufacturing, crystals can be cut to produce various crystal frequencies and can be ordered to increase molecular sensitivity or enhance mass measurements. After completing a test, the heater can then be used to boil off the condensed material on the crystal and testing can continue.

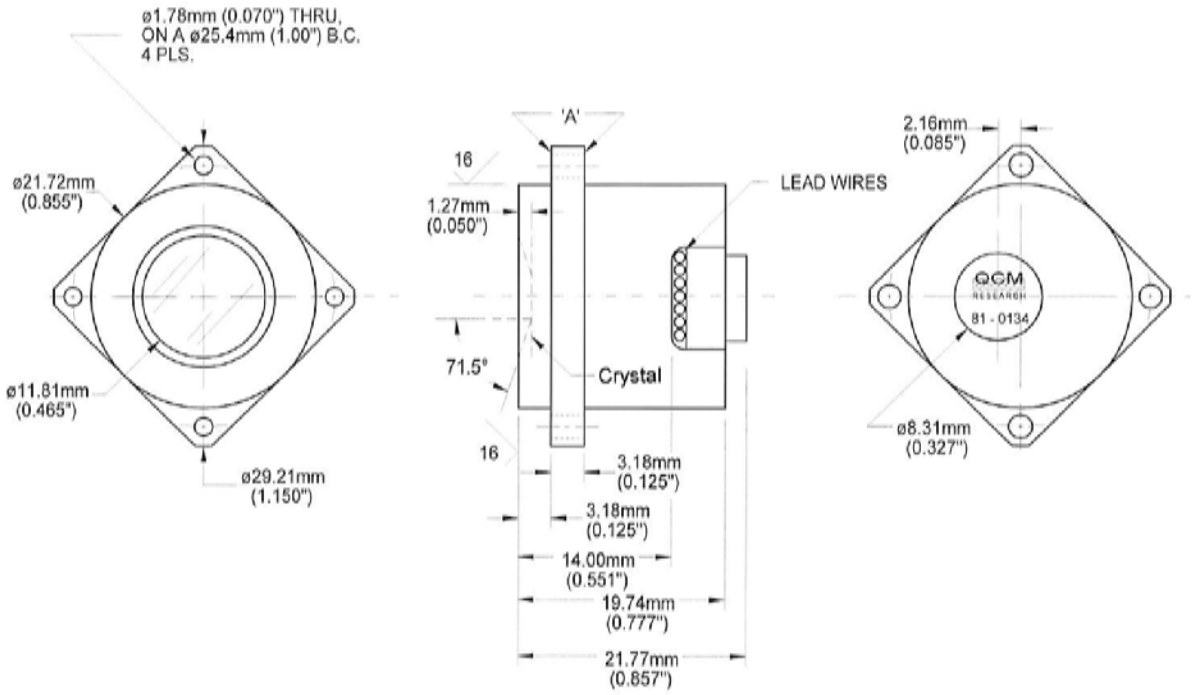
CQCMs are often used in vacuum chambers to investigate various aspects of outgassing from spacecraft surfaces. The crystals can be over-coated to record the erosion rate of a coating during Low Earth Orbit, or the erosion or deposition from ion thrusters. They have been used to monitor contaminants on telescope lenses and solar panels. Our LT (Low Temperature) line of CQCMs are eminently useful for liquid helium operation.

QCM Research offers four models of CQCMs: the MK16, MK17, MK18 and the MK19. CQCMs are similar but with differences in the mounting flange and cabling options. The MK19 is designed for situations where crystal temperature control is not desirable.

When utilizing QCMs in a vacuum chamber, commands and communication with the QCMs are possible with M2000 Control / Data Acquisition Unit. This is a complete hardware and software package that works with a host PC and controls the QCM(s) and records the testing in a graph and spreadsheet formats. For space flight our modular M3000 Controller is available. It also controls the QCMs and is integrated into the onboard computer system.

Every QCM is built to order and fully customized to your needs. All of our QCMs can be flight qualified and have flight history. Flight QCMs are customarily tested to your specifications and can be delivered with environmental testing completed.

Dimensions



Specifications

Operating Temperature Options	Standard Temperature	Low Temperature
Temperature Range	-199 to 100 °C	10 to 400 °K (-263 to 127 °C)
Signal Amplitude	>6 to 10 Vp-p	0.2 to 2.0 Vp-p
Voltage Sensitivity	<23 Hz/V	<23 Hz/V
Output Impedance	12K Ohms	13K to 27K Ohms
Pressure Range	Ambient to Hard Vacuum	Ambient to Hard Vacuum
Supply Voltage	8 to 12 VDC (10 VDC nominal)	8 to 12 VDC (10 VDC nominal)
Continuous Power Requirement	~120mW@10VDC	2.45mW@10VDC
Power / In-Situ Heater	<5.8W	<5.8W
Temperature Sensor	Included	Included
Weight	28.5 grams	28.5 grams
Field of view	71.5° Half Angle	71.5° Half Angle

Crystal Frequencies	10 MHz Crystals	15 MHz Crystals
Mass Sensitivity	2.26×10^{8} (Hz/gm)cm^2	5.09×10^{8}(Hz/gm)cm^2
Frequency Range	To ~ 100KHz	To ~ 150KHz
Mass Range	4.42×10^{-4}gm/cm^2	2.95×10^{-4}gm/cm^2

Crystal Options

Crystal Frequencies	**10 MHz Crystals**		**15 MHz Crystals**	
Crystal Cut	AT	Sunwise	AT	Sunwise

Ordering Information

Commercial or Flight & Crystal Heater Options	**Crystal Heater Type**	**Laboratory**		**Flight**	
		Model Number	Part Number	Model Number	Flight Number
MK16 CQCM Models	Standard Unit w/ 1KΩ Crystal Heater	MK16	96-1458-01-01	MK16	96-1458-01-02
	Low Temperature w/ Silicon Diode Crystal Heater	MK16 LT	96-1458-02-01	MK16 LT	96-1458-02-02
	Standard Temperature /w Silicon Diode Crystal Heater	MK16 SiD	96-1458-03-01	MK16 SiD	96-1458-03-02
	Standard Temperature w/150Ω Crystal Heater	MK16 150Ω	96-1458-04-01	MK16 150Ω	96-1458-04-02

QCM Control/Data Acquisition Units (for use with the MK16)

Controller Options for the MK16	Description	Laboratory		Flight	
		Model Number	Part Number	Model Number	Part Number
Model 2000	**M2000 Standard Configuration:** Supports 4 TQCMs	M2000-416 (4=channels) (10=QCM Model)	81-1839-02		
	M2000 Expansion board(s): Each board supports 4 additional QCMs up to 12 channels		81-1540-00		
	M2000 Effusion Heater Board Option	M2000-416-H	Call		
Model 3000	**M3000 Standard Configuration:** Modular design 2 to 8 channels			M3000-416 (4=channels) (16=QCM Model)	81-2414-03

For more detailed information on QCMR controllers, see the specific controller brochure

Cable Options (For use with the MK16)

Cable Options / MK16 to M2000 Controller Cable	Description	Laboratory	
		Model Number	Part Number
MK16 Cables	**Standard cable**: 10′ (3m), or custom to a maximum length of 65′ (20m)	M2010-16-YY (YY = Length/Ft)	88-1629
	Extended length cable: custom to a maximum length of 250′ (76m)	M2020-16-YY (YY = Length/Ft)	88-2554
	Conflat Feedthrough cable with 1.33 CF or 2.75 CF flanges: custom to a maximum length of 65′(20m)	M2015-16-YY-ZZ-F (YY = External/Ft) (ZZ = Internal/Ft) (F = 2.75 CF Flange)	88-2377-01
		M2015-16-YY-ZZ-FM (YY = External/Ft) (ZZ = Internal/Ft) (F = 1.33 Mini CF Flange)	88-2377-02
	Douglas Feedthrough cable with 1.0″ or 1.25″O.D. : custom to a maximum length of 65′(20m)	M2015-16-YY-ZZ-DF (1.0″) (YY = External/Ft) (ZZ = Internal/Ft) (DF = Douglas Feedthrough)	By Request
		M2015-16-YY-ZZ-DF (1.25″) (YY = External/Ft) (ZZ = Internal/Ft) (DF = Douglas Feedthrough)	By Request

QCMR cables for the MK16 are shielded and twisted pair with a 15 pin D-Sub connector end and 9 pin connector plug. Need something special? Give us a call.

Combination Packages and Quantity Discounts

The following quantity discounts apply to combinations of like items:

Quantity Ordered	Additional Discount
3-5	5%
6-10	7.5%
More than 10	10%

Warranty Statement

QCM Research products are warranted for a period of ONE YEAR from the date of receipt by the purchaser against defects in materials and workmanship. QCM Research expressly limits its liability to the replacement or repair of the article furnished (this choice is at the sole discretion of QCM Research). This warranty does not apply to products that have been disassembled, modified or subjected to conditions exceeding the applicable product specifications and ratings. In the event of any of the foregoing, the warranty will be void. Failure due to excessive contamination is not covered under warranty, whether from proper or improper use. QCM Research disclaims any warranty other than as specifically set forth herein, and may discontinue models or alter their specifications without notice.

Contact

Talk with our friendly, competent staff about your measurement needs. Our hours are 9AM to 5PM Pacific Standard Time (PST), Monday through Friday.

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