QCM Research

Contamination and Outgassing Detection Products
for Laboratories and Aerospace

Introducing the

Mark 10

Thermoelectric Quartz Crystal Microbalance

Overview

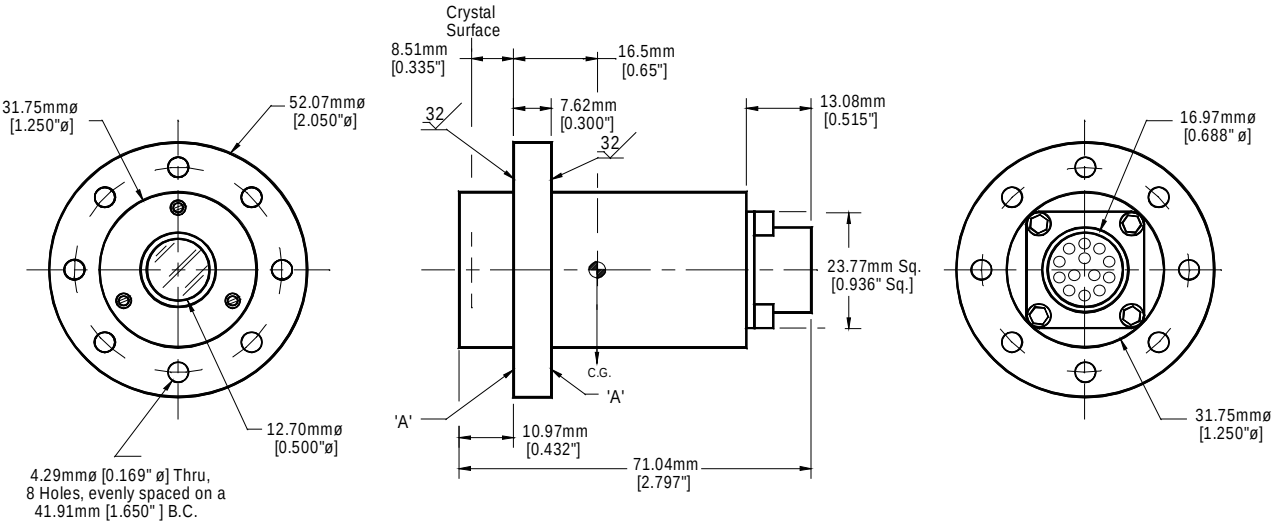
The Mark 10 Thermoelectric Quartz Crystal Microbalance (MK10 TQCM) has become the defacto industry standard TQCM. By cooling the 10 or 15 MHz quartz crystals, measurements can be made of the mass flow as it intercepts and is condensed at a specific temperature. For space applications, the Sunwise crystal option has been added to minimize the solar thermal radiation input on the crystals.

The MK10 can be cooled by its own in-situ thermoelectric Peltier element without any external refrigerant, with a delta T of > 70°C when the heat sink is at ambient temperature. This feature makes it particularly useful for material laboratories in the investigation of vacuum outgassing of spacecraft materials. Monolayers of contamination are quite easily seen. Additionally, a flight MK10 placed on a satellite will assure that the sensor crystal temperature for condensation of the particular contaminates will be obtained. Two MK10 sensors have been supplied, for example, for measuring the backflow of gasses onto a satellite from an ion rocket exhaust.

Baking the QCM at 40° to 50°C eliminates the accumulated contaminants. The technique of slowly raising the temperature can be used for selectively identifying all of the fractionations that may be condensed. If the MK10 is actually cooled externally at its heat sink plane of attachment, the lowest temperature at which it can operate is extended to approximately -200°C.

MK10 TQCMs can be flight approved and have a successful flight history. Custom orders are common and welcome. Call to discuss how we can build a MK10 TQCM system to meet your needs.

Dimensions



Specifications

Sensor Output	2K to ~250KHz
Temperature Range	100 to ≤-100°C (Active), 100 to -199°C w/o Temp Control (Passive)
Signal Amplitude	>6 to 10Vpp
Voltage Sensitivity	<23 Hz/V
Output Impedance	12KΩ
Pressure Range	Ambient to Hard Vacuum
Supply Voltage	8 to 12 VDC (10V nominal)
Continuous Power Requirement	~120mW @ 10VDC w/o Peltier
Peltier Heat Load	6.25 watts maximum
Weight	120 grams
Field of View	74.5° 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

Mark 10 Models	**Description**	**Laboratory**		**Flight**	
		Model	**Part Number**	**Model**	**Part Number**
Mark 10 TQCM	Standard Unit 15MHz with a 1KΩ Platinum Resistance Thermometer (PRT)	MK10 TQCM	96-1215-01-01	MK10 Flight TQCM	96-1215-01-02

QCM Control/Data Acquisition Units (for use with the MK10)

Controller Options for the MK10	Description	Laboratory		Flight	
		Model Number	Part Number	Model Number	Part Number
Model 2000	**M2000 Standard Configuration:** Supports 4 TQCMs	M2000-410 (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	M2000-410-H	Call		
Model 3000	**M3000 Standard Configuration:** Modular design with 2 to 8 channels			M3000-410 (4 = channels) (10 = QCM Model)	81-2414-03

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

Cable Options (For use with the M2000 controller and the MK10 TQCM)

Cable Options / M2000 controller to the MK10 TQCM	Description	Laboratory	
		Model Number	Part Number
MK10 Cables	**Standard cable**: 10′ (3m), or custom to a maximum length of 65′ (20m)	M2010-10-YY (YY = Length/Ft)	88-1630-01
	Extended length cable: custom to a maximum length of 250′ (76m)	M2020-10-YY (YY = Length/Ft)	88-1630-02
	Conflat Feedthrough cable with 1.33 CF or 2.75 CF flanges: custom to a maximum length of 65′(20m)	M2015-10-YY-ZZ-F (YY = External/Ft) (ZZ = Internal/Ft) (F = 2.75 CF Flange)	88-2378-01
		M2015-10-YY-ZZ-FM (YY = External/Ft) (ZZ = Internal/Ft) (F = 1.33 Mini CF Flange)	88-2378-02
	Douglas Feedthrough cable with 1.0″ or 1.25″O.D. : custom to a maximum length of 65′(20m)	M2015-10-YY-ZZ-DF (1.0″) (YY = External/Ft) (ZZ = Internal/Ft) (DF = Douglas Feedthrough)	88-2423-01
		M2015-10-YY-ZZ-DF (1.25″) (YY = External/Ft) (ZZ = Internal/Ft) (DF = Douglas Feedthrough)	88-2423-02

QCMR cables for the MK10 are shielded and twisted pair with a 15 pin D-Sub connector end and a 13 pin connector-plug. Need something special? Give us a call.

Combination Packages and Quantity Discounts

The following combinations are offered at a discounted rate:

M2000-410 controller, plus 3ea. MK10 TQCMs (includes 3 M2010-10-YY Cables)
M2000-410 controller, plus 4ea. MK10 TQCMs (includes 4 M2010-10-YY Cables)

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 PST, Monday through Friday.

QCM RESEARCH

41831 McAlby Ct., Suite C
Murrieta, CA 92562

Phone: (951) 694 - 9539
Fax: (951) 694 - 9538
Email: Information@QCMResearch.com
Web: www.QCMResearch.com