Maxtek RQCM

Quartz Crystal Microbalance Research System

REAL-TIME CRYSTAL FREQUENCY, MASS AND RESISTANCE MEASUREMENT

RQCM is a highly advanced method of measuring film properties during processes such as deposition, dissolution or permeation. Up to three crystals can be measured simultaneously with < 0.4 ng/cm² mass resolution. All data is logged and graphically displayed using integrated Windows® based software in real time.

The heart of this system is a performance, phase lock oscillator with measurement frequency from 3.8 to 6 MHz or 5.1 to 10 MHz. The circuit also incorporates adjustable crystal capacitance cancellation, reducing error caused by parasitic capacitance of the crystal. This is essential for accurate measurement of lossy (soft) films. The crystal face is electrically isolated from earth ground allowing an external current or voltage source to be connected to it.

An optional data acquisition card accommodates RTD, thermocouple and thermistor data, as well as five scaleable, analog inputs. One can, for example, combine the potential and current outputs of a potentiostat with the mass, frequency and crystal resistance data of the QCM. The software permits a view of either time or an analog variable along the X-axis for studies under cyclic conditions.

An optional input/output card allows control of external devices (such as pumps, heaters, valves) with eight remote inputs and eight relay outputs.

FEATURES AT A GLANCE

- Integrated Windows® based software included
- Measures up to three crystals simultaneously
- <0.4 ng/cm^2 measurement resolution
- Frequency range: 3.8 to 6 MHz, 5.1 to 10 MHz
- Supports heavily loaded crystals
- Capacitance cancellation
- Electrically isolated crystal electrode
- Onboard data acquisition
- Control inputs and outputs

SPECIFICATIONS

CRYSTAL MEASUREMENT

Crystal Measurement Channels	One standard. Three max.
Frequency Ranges - Dual	3.8 to 6.06 MHz, 5.1 to 10 MHz
Frequency Resolution	0.03 Hz @ 6.0 MHz
Mass Resolution	<0.4 ng/cm^2 (0.014 Å Aluminum)
Capacitance Compensation Range	40 to 200 pfd

ACHIEVABLE CAPACITANCE

Compensation	± 0.3 pfd
Crystal Resistance Range	5 to 5000 ohms
Phase Angle Accuracy	± 2 degrees
Phase Angle Stability	± 0.5 degrees
Frequency Error Vs. Phase Error and Crystal Q	Q = 100,000 - 0.087 ppm per degree Q = 10,000 - 0.87 ppm per degree Q = 1,000 - 8.7 ppm per degree
Measurement Update Rate	From 0.5 to 20 updates/sec.
Operating Temperature Range	0 to 50ºC
Operating Temperature for Stated Stability	20 ± 10ºC
Crystal Drive Voltage, open circuit	125 mV RMS
Crystal Drive Source Impedance	20 ohms ± 1%
Crystal Power	200 micro watt, maximum
Crystal Face Isolation	Transformer, ± 200 VDC maximum

DATA ACQUISITION INPUTS

Number of Voltage Channels	5
Resolution	16-bit
Selectable Range	0-5V, ± 5V, 0-10V, ± 10V
Gain Accuracy	± 0.01%, ± 0.02%, ± 0.01%, ± 0.02%
Zero Offset	± 2 mV
Gain Nonlinearity	<2 LSB
Single Ended Input Impedance	1 Megohm
Differential Input Impedance	2 Megohm
Input Protection	± 200V
Common Mode Range	± 200V
Common Mode Rejection	70db up to 200 Hz

COMMUNICATIONS

RS-232 Serial Port - standard
RS-485 Serial Port - optional
IEEE-488 Port - optional

DISCRETE I/O

Passive I/O Card	Eight ground true 4.7 kohm pulled up to 5 volts Eight SPST Relays, 120 VA, 2 Amp maximum

FRONT PANEL INDICATORS

RS-232 / IEEE-488 status
LEDs
System Ready LED

POWER REQUIREMENTS

100, 120, 220, 240 VAC
50/60 Hz, 25 watts

PHYSICAL

Size	4”H x 13”W x 9-3/4”D
Weight	7 lbs.
Shipping Weight	10 lbs.

THERMOCOUPLE INPUT

Type	Type “T” Thermocouple
Temperature Range	0 to 371ºC
Accuracy	± 2ºC + Sensor Error

RTD INPUT

Type	100 ohm Thin Film Platinum
Temperature Range	0 to 600ºC
Accuracy Range	± 4ºC + Sensor Error

THERMISTOR INPUT

Type	100 kohm
Temperature Range	0 to 150ºC
Accuracy	± 0.5ºC + Sensor Error

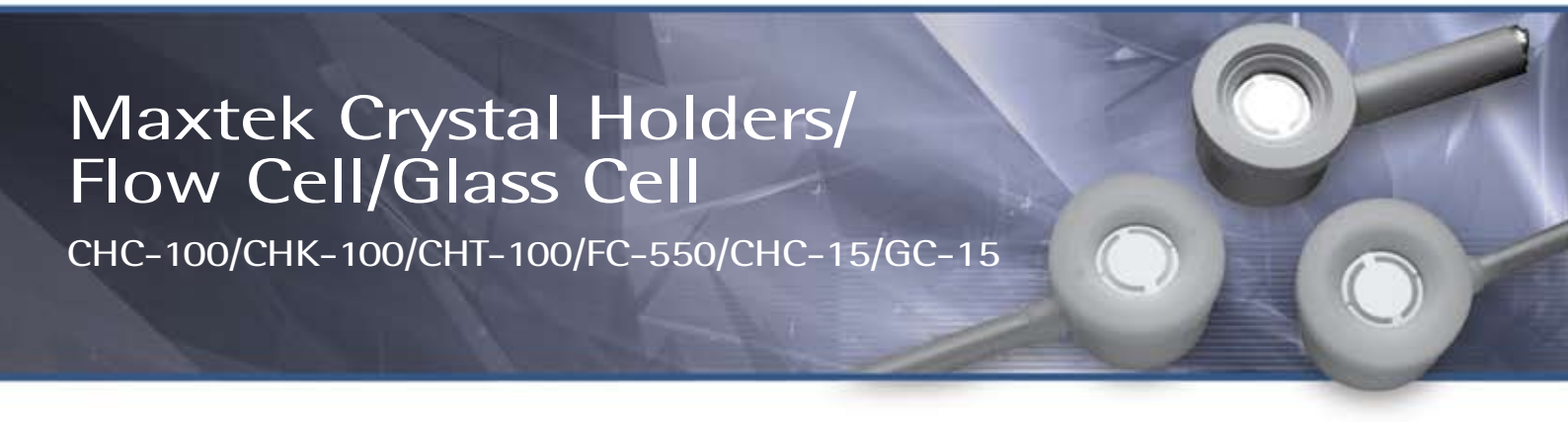
ORDERING INFORMATION

Part #	Description
603200	(RQCM) Research Quartz Crystal Microbalance (3.8 to 6 MHz Frequency Range)
603200-2	(RQCM) Research Quartz Crystal Microbalance (5.1 to 10 MHz Frequency Range)
Available Options	
603208	Crystal Measurement Card (3.8 to 6 MHz Freq. Range) RQCM crystal measurement assembly (2 additional cards max.)
603208-2	Crystal Measurement Card (5.1 to 10 MHz Freq. Range) RQCM crystal measurement assembly (2 additional cards max.)
603209	Data Acquisition Card. Provides 5 analog inputs and 3 temperature inputs
603210	Passive Input/Output Card. Provides 8 active low TTL level (0-5 volt) inputs, 8 programmable relay outputs and 1 dedicated abort relay output.
179217	IEEE-488 Card. Provides IEEE-488 communication port.
179219	RS-232 to RS-485 Conversion Kit. Upgrades the standard RS-232 port to RS-485
Accessories	
172205	CHT-100, Teflon® Crystal Holder. (1” dia. crystal. SMB termination.)
173205	CHC-100, CPVC® Crystal Holder. (1” dia. crystal. BNC termination.)
184204	CHK-100, Kynar® Crystal Holder. (1” dia. crystal. SMB termination.)
603216-2	Cable, SMB plug to SMB plug, 2’ length
888023	Adapter, BNC plug to SMB jack
184208	FC-550 Flow Cell. Easily attaches to any CHx-100 series Crystal Holder. Kynar body with Viton® o-ring.

INFICON Instruments for Intelligent Control®

Maxtek Crystal Holders/ Flow Cell/Glass Cell

CHC-100/CHK-100/CHT-100/FC-550/CHC-15/GC-15



DESIGNED FOR EASY, RELIABLE CRYSTAL REPLACEMENT

The CHC/CHK/CHT-lOO crystal holders are designed to be dipped into a liquid. The crystal holders provide users with a rugged and easy to use quartz crystal housing for QCM experiments. Seamless construction, a choice of three chemically resistant materials and an o-ring sealed crystal allow the holders to be used in a wide variety of gases and liquids over a broad temperature range. A removable retainer permits easy crystal replacement. The compact holders are designed to use 1 inch diameter sensor crystals.

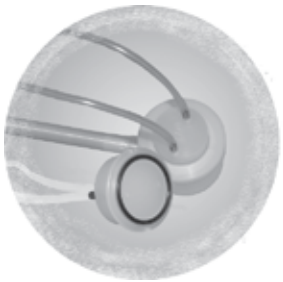
The CHC-100 holder is made of CPVC material, uses Viton® o-rings and is terminated with a standard female BNC connector. The CHK-100 is made of Kynar® material, uses Kalrez® o-rings and is terminated with a male SMB connector. The CHT-lOO is made of Teflon® material, uses Kalrez o-rings and is also terminated with a male SMB connector.

The FC-550 Flow Cell is designed to be used with any of the INFICON Maxtek 550 series probes or 100 series crystal holders. The FC-550 is made from Kynar. The cell has two stainless steel inlet and outlet tubes with .047" L.D. x .062" O.D. (outside diameter). A Viton o-ring provides sealing between the cell and the face of the sensor crystal. The cell is used in place of the Crystal Retainer Ring. Once installed in the crystal holder, it creates a flow chamber of approximately 0.1 ml.

The CG-15 is a 45 ml volume glass cell including the CHC-15 crystal holder, clamp and stopper. The CHC-15 crystal holder is designed for use with a Chem Glass® joint, CG124-04, and clamp and allows the user to create a glass cell of their own design.

FEATURES AT A GLANCE

- Easy Crystal Replacement
- Rugged Construction
- Compact Design
- Liquid Compatible



FC-550
Flow Cell

CG-15
Glass Cell

Crystal Holder
CHC-15

SPECIFICATIONS

CHC / CHK / CHT	CHC-100	CHK-100	CHT-100
Length	10 cm (4”)	10 cm (4”)	10 cm (4”)
O-ring	Viton	Kalrez	Kalrez
Material	CPVC®	Kynar	Teflon
Temperature	-25ºC to 95ºC	-25ºC to 110ºC	-25ºC to 85ºC
Connector	BNC	SMB	SMB

FC-550

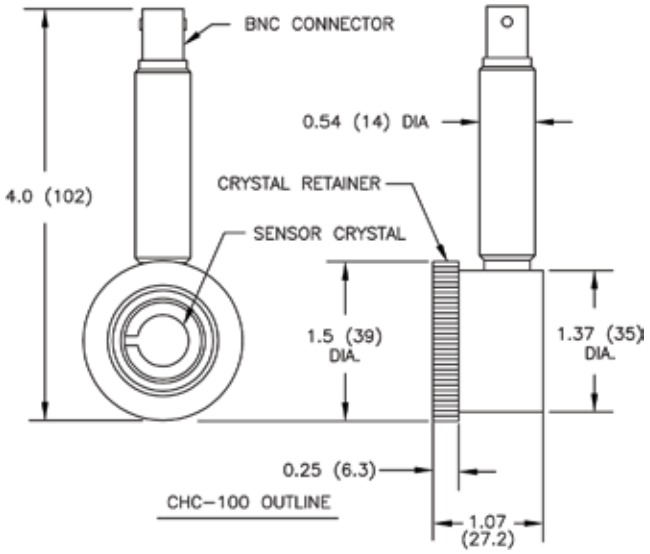
Cell Material	Kynar
Inlet & Outlet Tubes	SS-304
O-ring	Viton

CHC-15 Crystal Holder

Material	CPVC
O-ring	Viton
Temperature	-25ºC to 95ºC
Connector	SMB

GC-15 Glass Cell

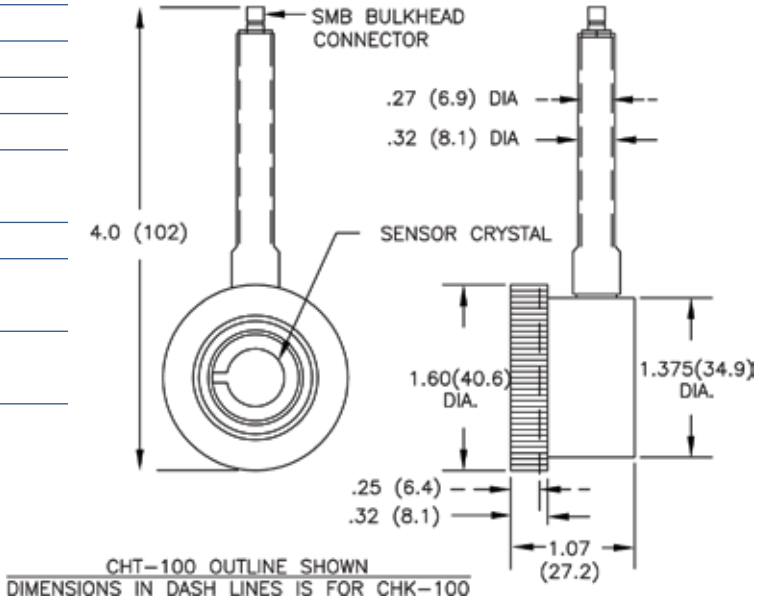
Material	Pyrex Glass
O-ring	Viton
Approx. Volume of Water	45 ml
Temperature	20ºC to 300ºC
Connector	SMB



CHC–100 OUTLINE

ORDERING INFORMATION

Model #	Part #	Description
CHC-100	173206	CPVC Crystal Holder
CHK-100	184204	Kynar Crystal Holder
CHT-100	172205	Teflon Crystal Holder
FC-550	184208	Flow Cell
GC-15	623204	Glass Cell with CH-15 Crystal Holder
CH-15	623200	CPVC Crystal Holder
SC-501-1	149211-1	Crystal, 5 MHz Gold, Polished, 1” Dia.
SC-501-2	149211-2	Crystal, 5 MHz Gold, Unpolished, 1” Dia.



CHT–100 OUTLINE SHOWN
DIMENSIONS IN DASH LINES IS FOR CHK–100

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