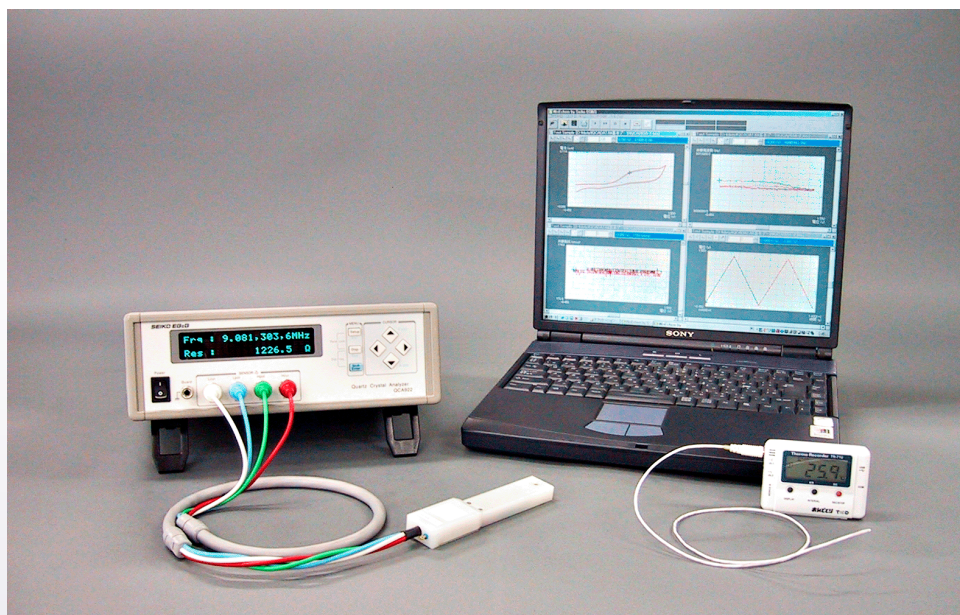


Measure Resonance Frequency and Resistance Simultaneously!

Crystal Resonator Chemistry Measurement System

Model : QCA922



Crystal Resonator Chemistry Measurement System QCA922 is Quartz Crystal Microbalance (QCM) that our company recommends with oneself, and "Resonance frequency" and "Resonance resistance" can be measured simultaneously.

Various measurements are possible in the system that connects QCA922 not to mention the standalone operation with Potenshostat/Galbanostat and accessories, etc.

- Data measurement from WinEchem software
- EQCM measurement that connects Potenshostat/Galbanostat
- Eight channel measurement simultaneously at the time of connected multiplexer
- Measurement of resonance frequency, resonance resistance, and temperature in which thermometer is connected simultaneously

QCA922

Measure resonance frequency and resistance simultaneously

The QCA922, an instrument developed for piezoelectric gravimetry in the ng- μ g regions, monitors both resonance frequency and resonance resistance of a Pt or Au coated AT-cut crystal resonator. The measurement of the resonance frequency and the resonance resistance simultaneously was achieved by adopting the detection method of scanning the frequency of the crystal resonator directly.

Highly accurate, steady measurement value

Measurements of the resonance frequency improve the straight line and the range of the maximum load has been improved greatly well. The measurement value is very highly accurate and steady.

Measure mass change and viscoelasticity change simultaneously

The resonance frequency changes by both the mass change and the viscoelasticity change in the surface of the crystal resonator, and the resonance resistance reflects a viscous change in this strongly chiefly while measuring it. Therefore, past unit that measured only the resonance frequency was not able to distinguish whether it was the one that in which a mass change or a viscous change in the surface of crystal resonator the change in the frequency originates for the sample with the viscoelasticity. However, analyzing the contribution of a mass change and a viscous change from the correlation became possible, because it was able to measure the resonance frequency and the resonance resistance at the same time in this unit.

Wide frequency pulling range

This unit can correspond to a wide frequency without the circuit change because the oscillation signal is generated with the oscillator of the DDS method in the main unit.

Data measurement from computer with WinEchem

The unit can be set directly from the computer through the GPIB interface of standard equipment, and data can be measured.

EQCM measurement

The EQCM measurement became possible by the connection with Potenshostat/Galbanostat. Each correlation can be analyzed by measuring an electrochemical change and the quartz crystal microbalance change simultaneously.



Model QCA922-00 Front Panel

Display

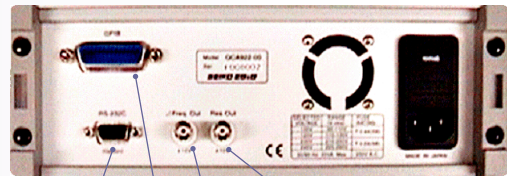
Two either the resonance frequency, the resonance resistance or the Δ frequency are displayed in VFD of 40 digit \times 2-row.

Control Key

MENU Key & CURSOR Key

Sensor (Cell Cable) connectors

Four connectors are used to connect a special crystal resonator cell cable.



Model QCA922-00 Rear Panel

RS-232C Interface Connector

GPIB Interface Connector

Res Out Connector

Analog voltage output of resonance resistance

ΔFreg Out Connector

Analog voltage output of resonance frequency

Cells

Dip Type & Well Type

The cell is used to connect the crystal resonator with the main unit of the QCA922. The purpose to use the cell is to connect the crystal resonator with the electric circuit of the main unit. Moreover, to insulate either electrode from solution electricity and chemically, the crystal resonator is mechanically maintained.

Dip cell

QA-CL3 is connected with the main unit through the adaptor cable (QCA922-20 or QCA922-10).

Well cel

QA-CL4 is connected with the main unit through the adaptor cable (QCA922-10).

QA-CL5 made from a transparent material can confirm the state of the solution put in a Well.

Dip type cell QCA922-20 can use it by installing QCA917-30 as Well type cell.

Cell kit for EQCM

Additionally, the cell kit for the EQCM measurement that combines QA-CL4 with microcell kit K0264 etc. made by Princeton Applied Reserch is prepared.

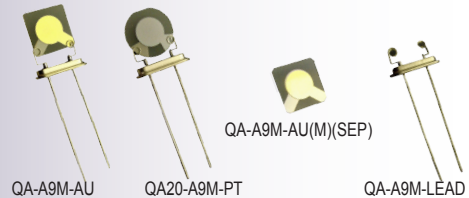


Quartz Crystal Resonator

9MHz AT-cut

QCA922 is measured by using the crystal resonator of 9MHz and the AT cutting. The crystal resonator of a lot of types is prepared; ten kinds of electrode materials including gold and platinum, rectangle or round type shape, specular finish and separation type, etc.

Note: I will produce in custom-designed, and feel free to inquire, please.



Potenshostat/Galbanostat

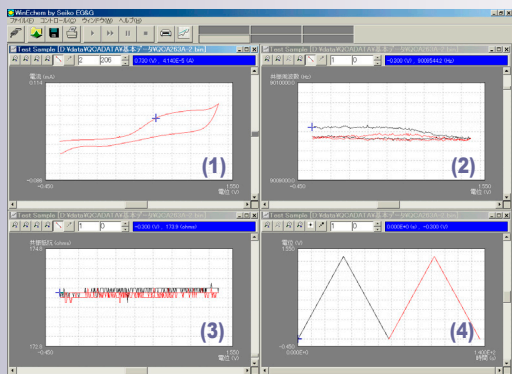
for EQCM

The QCA922 is connected with Potenshostat/Galbanostat, and can be applied to the EQCM measurement. In this case, terminal W of the cell is connected with the working electrode cable of Potenshostat/Galbanostat. Made of Princeton Applied Reserch 263A-1 and 263A-2 are prepared.

Note: Another maker's Potenshostat/Galbanostat can be prepared. Please consult.

WinEchem controls QCA922 and Potenshostat/Galbanostat (made by Princeton Applied Reserch) on Windows XP/2000/98/95, measures the resonance frequency, the resonance resistance, potential, the current, and the temperature, etc. , and displays the graph on four screens or less in real time. Because data can be preserved by the file format of the binary or CSV, it is possible to output also to Excel not to mention reading with WinEchem easily, and it is possible to use it as data affixed to the report.

Note: This software can also control product QCA917 so far.



A left chart shows the measurement result at Fe(CN) 64- that used 9MHz Pt for the working electrode.

- (1) Voltamograph
- (2) Crono-rezonnance-frequency(CF)
- (3) Crono-rezonnance-resistance (CI)
- (4) Crono-potenshomety(CE)

Example of displaying four screens

The main usage

QCM measurement: QCA is controlled alone. Adsorption detaching and viscoelasticity change of the protein at the elapsed time are examined from the resonance frequency and the resonance resistance.

EQCM measurement: QCA and Potenshostat/Galbanostat are controlled. The state of a chemical kind in the liquid is examined from the measurement such as the currents by fixed potential, movement potential, and natural potential.

EC measurement: Potenshostat/Galbanostat is controlled alone. CV, CA, CE or the corrosion measurement is done, and the interaction of the electrode and the solution is examined.

Other usages

Schedule mode: In this mode, when the gate time and the number of measurement points of three steps are set, it is possible to measure it continuously.

Multi mode: In this mode, the multiplexer is controlled, and the data of 8 channels or less can be taken. (The display is four screens or less.)

Temperature monitor: The resonance frequency can be corrected by the temperature change by measuring QCA and the thermometer simultaneously.

Accessories



QCA922-60

Temperature controlled bath

QCA922-60 is a micro temperature controlled bath. (made by Nippon Blower company) This prevents the change according to the temperature that brings the influence to the resonance frequency and the resonance resistance measured with QCA922.



QCA922-70

Temperature measurement unit

QCA922-70 measures the temperature simultaneously while QCA922 is measuring the resonance frequency and the resonance resistance. (made by T&D Corporation Japan)



QCA922-90

Multiplexer

QCA922-90 can measure the crystal resonator of eight channels or less sequentially.

Applications

Application to electrochemical reaction

Electrochemistry extraction, Formation of Polymer film of electrode, Corrosion, Adsorption, Analysis of electrochemistry reaction mechanism etc.

Gas sensor

Measurements of NOx, SOx, humidity, organic, and smell material, etc.

Biosensor

Antigen and antibody reaction, Measurement of microorganism and cell adsorption phenomenon, Fixed quantity of density of protein, DNA analysis(Immunoassay)

Viscosity measurement

Viscosity information on liquid, Analysis of gel reaction(fixed quantity of end toxin and blood coagulation factor), Measurement of phase transition, Heat analysis

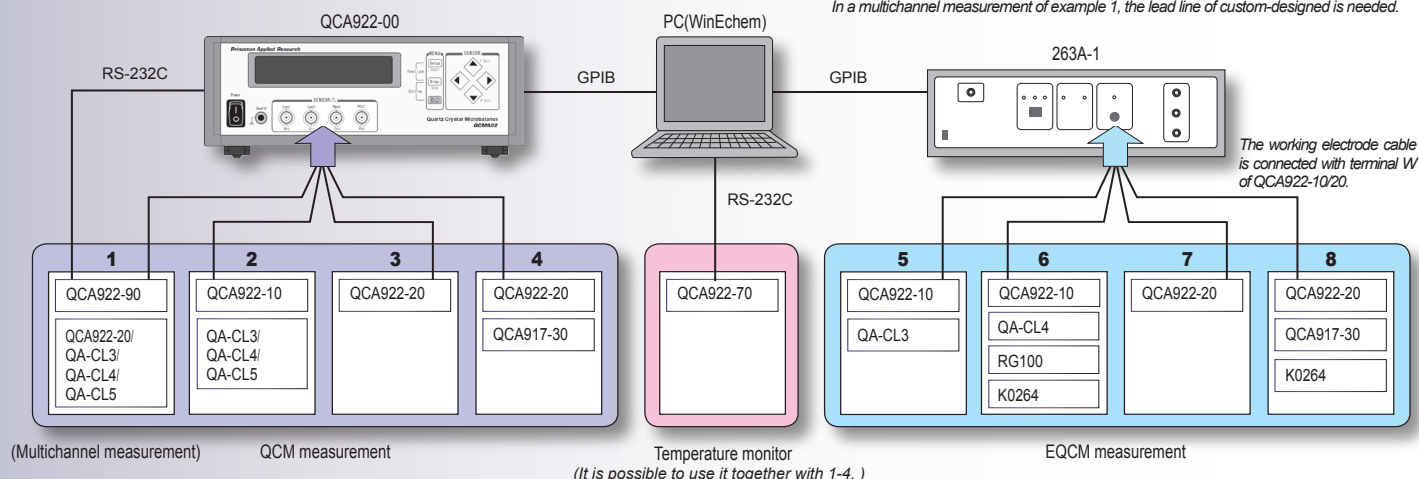
Example of System Configuration

The QCA922 system can be used by the following eight combinations.

Note: QCA922-70 cannot be used together with the EQCM measurement.

QCA922-60 can be used by example 1-8 all.

In a multichannel measurement of example 1, the lead line of custom-designed is needed.



(It is possible to use it together with 1-4.)

Specifications

■ Quartz Crystal Analyzer Main Unit QCA922-00

Measurements	(Series)Resonance frequency and Resonance resistance
Resonance frequency	Measurement resolution: 0.1 Hz, Measurement range: 1-10 MHz
Resonance resistance	Measurement resolution: 0.1 Ω, Measurement range: 10 Ω-16 kΩ
ΔFreq. analog output	Output voltage range: ±10 V (12 bits) Output range: ±200 Hz, ±2 kHz, or ±20 kHz selectable
Res. analog output	Output voltage range: 0-10V Output range: 1kΩ, 2kΩ, 4kΩ, 8kΩ or 16kΩ selectable
Gate time	0.1 sec, 1.0 sec or 10.0 sec selectable
Display	VFD of 40 digit x 2-row Display of (series) resonance frequency and resonance resistance simultaneously
External interface	IEEE-488(GPIB) or RS-232C
Power-supply voltage	AC 100 V, 120 V, 230 V or 240 V selectable, 50 Hz or 60 Hz selectable
Fuses	1.0 A 250 V slow-blow (@ AC 100V/120V/230V/240V)
Power consumption	normally approx. 15 VA (Max. 20 VA)
Dimensions	260 mm x 230 mm x 88 mm
Weight	Approx. 3.3 kg (cable excluded)
Ambient temperature	0 to 40 °C

■ Adaptor Cable for QA-CL Series QCA922-10

Materials	Substrate case: PVDF, Stop screw: Stainless steel
Connected cable	Connector: BNC plug (male) × 4, Cable: Coaxial compound cable about 0.9 m
Terminal W	Connects with the measurement side electrode of crystal internally through Low Pass Filter, or connects with the working electrode cable.
Dimensions	35 mm x 65 mm x 20 mm
Weight	200 g (cable included)
Ambient temperature	0 to 40 °C

■ Dip Cell QA-CL3 ■ Well Cell QA-CL4, QA-CL5

Materials	[QA-CL3 & CL4] Main body: PVDF, O-ring: Viton, Stop screw: Stainless steel [QA-CL5] Main body: Chloridization vinyl, O-ring: Viton, Stop screw: Stainless steel
Dimensions	[QA-CL3] 25.5 mm x 20 mm × 12 mm [QA-CL4] 25.5 mm x 20 mm × 22 mm [QA-CL5] 25.5 mm x 20 mm × 17 mm
Well capacity	[QA-CL4] 750μl [QA-CL5] 250μl
Usage	[QA-CL3] Liquid or air [QA-CL4 & CL5] Cell is filled with sample solution

■ Dip Cell for QCA922 QCA922-20

Materials	Main body: PVDF, O-ring: Viton, Stop screw: Stainless steel
Connected cable	Connector: BNC plug (male) × 4, Cable: Coaxial compound cable about 0.86 m
Terminal W	Connects with the measurement side electrode of crystal internally through Low Pass Filter, or connects with the working electrode cable.
Dimensions	29 mm x 131 mm x 15 mm
Weight	Approx. 200 g (cable included)
Ambient temperature	0 to 40 °C
Usage	It is used in the sample solution or in air. Or, it is fixed to the Wel cell.

■ Quartz Crystal Resonator QA-A9M-PT, QA-A9M-AU

Resonance frequency	9 MHz
Cutting type	AT-cut
Electrode materials	Pt (platinum), Au(gold) 300 nm of electrode material is sputtered onto a Ti film groundwork.
Area of electrode	5 mm φ (A special area is possible in the option.)
Ambient temperature	-20 °C - 70 °C

Note: Sold in packages of 50 or 25 resonators.

■ Multiplexer for QCA922 QCA922-90

Number of channels	Eight channels or less
Adjustment cell	Well cell: QA-CL4 or QA-CL5, Dip cell: QA-CL3 or QCA922-20
Sampling time	0.3 sec, 1.0 sec or 10.0 sec selectable
Connected cable	Signal: 4BNC compound coaxial cable, about 90 cm Control: Nine pin D-SUB male connector, about 1.4 m
Material	PVDF (excluding screws and connectors)
Dimensions	Main body: 262 mm x 100 mm × 20 mm Base plate: 282 mm x 147 mm × 5 mm
Weight	Approx. 1 kg

■ WinEchem Electrochemistry Software PS-P500/W32EA

File	Saves and reads measurement data and setup parameters: Binary (*.bin) or CSV (comma division)(*.csv) MS-DOS version PS-P300/MS file (*.dat) can be read.
Print out	Prints out graphs and setup parameters.
Memory backup	Saves data in the backup file (Backup.bin) each time the application is closed. Saves current state and address of measuring instruments in the Winechem.ini file.
Control	Specifies and saves start, interruption, stop and measurement conditions in the file.
Measuring methods	CF(frequency), Cl(resistance), CV, LSV, CA, CC, CE, E _{corr}
Sampling rate	100 ms to 1000 sec., 4 ms to 1000 sec. (when only the potentiostat is used)
Scanning rate	1 μV/ sec to 1 V/sec
Control potential	±10 V (scanning ranges from 1 mV to 4 V)
Current range	1 nA to 1 A (10 ranges) or AUTO
Control current	±200% of the current range
Number of points	2 to 32767, 2 to 6144 (when the potentiostat is used)
Number of cycles	1 to (NP x NC) ≤ 32767
Sampling data	Resonance frequency, Resonance resistance, Temperature, Current, Potential, AUX(QCA917 only)
IR compensation	Positive feedback or current interrupt
Filter	I low pass filter (5.3 Hz or 590 Hz), E low pass filter (5.3 Hz or 590 Hz), I/E filter
Conditioning.	Conditioning potential (time), deposition potential (time), equilibration time, and other parameters can be specified. The elapsed time, current, and potential are skipped during conditioning.
Graphical	Up to 4 graphs in REMOTE and LOCAL files can be displayed. The window size can be changed and tile display is possible. The measurement data is graphed, then real-time graphs appear on the screen during measurements.
X, Y-axis	Parameters can be designated. Each label for the parameters is specified within 20 characters.
X, Y-axis parameter	(1)Time (T), (2)Log T, (3)T ^{1/2} , (4)T ^{-1/2} , (5)Current (I), (6)Log I , (7)Potential (E), (8)Log E , (9)AUX, (10)Electric charge, (11)Resonance frequency (F), (12)ΔF, (13)Admittance index, (14) Resonant resistor, (15)E in, (16) I in, (17)Temperature1, (18)Temperature2
Expand/Contact	Expand/Contract is possible in each X-axis and Y-axis. The view range is changed step by step, centering on the cursor position; During Expand, the display position can be changed using the scroll bar. Any area selected by dragging the mouse can be expanded.
Cursor	The cursor can be moved when you left-click the mouse or you shift the arrow mark key. Cursor coordinates are displayed on the screen.
Grid	Can be automatically specified according to the view range and view position.
Dot/Line	The dot/line display and dot-size can be changed.
Title of graph	Can be designated within 40 characters.
Display color	The display color is changed for each cycle during CV and CA measurements (for a total of 8 colors).
Calibration	Resonant resistor and external input (E in, I in and AUX) can be calibrated. Any file can be read.

■ Temperature Controlled Bath for QCA QCA922-60

Model	LS-5P (made by Nippon Blower company)
Input	AC 100 V, 1.5 A (50 Hz or 60 Hz)
Cooling capacity	25 W (at t=0°C)
Range of control temperature	-2.5°C to +70°C (at 20°C in temperature and a no load in the surrounding)
Cooling overheating method	Cooling and heating by effect of Peltier
Control method	Pulse width modulation method by PID control (auto tuning having)
Set accuracy	Either of ± (0.3%+1digit) or ±0.9°C is large.
System requirements	Temperature: 0 to 40°C, Humidity: 35 to 85%
Size of bath on inside	150 mm x 200 mm × 150 mm
Alarm output	Relay output, 17 kinds of event
Telecommunication facilit	EIA standard, RS-485 conforming
Setting at step time	99 hours and 59 minutes or less
Control mode	Fuzzy PID with auto tuning

■ Temperature Measurement Unit for QCA QCA922-70

Model	TR-71U (made by T&D corporation Japan)
Number of channels	Two channels (selection from built-in 1ch or external sensor 2ch)
Built-in temperature sensor	-10°C to +60°C
Built-in sensor heat time constant	12 minutes
Measurement accuracy	Average ±0.3°C(-20 to 80°C), Average ±0.5°C(-40 to -20°C or 80 to 110°C)
Measurement and display resolution	0.1°C
Sensor	Thermally sensitive resistor
Liquid crystal display	Measurements, State of measurement record, Battery longevity warning, Time base range exaggerated, Amount of recorded data, Unit
Power supply	AA alkaline battery (LR6)
Battery longevity	About one year
Data backup	When the voltage of the battery decreases or switch OFF
Interface	Serial communications (RS-232C)
Dimensions	77 mm x 18 mm × 55 mm
Weight	62 g (one AA alkaline battery included)
System requirements	Temperature: -10°C to 60°C, Humidity: 90%RH or less
Option sensor (TR-0106)	TPE resin coating sensor, 2. Cable length: 0.6m, Heat time constant: about 75 seconds in air

Specifications are subject to change without prior notice.

Rev.1.4 in September, 2008



SEIKO EG&G CO.,LTD.
6F, Grande Bldg., 2-26-9, Hatchobori, Chuo-ku, Tokyo, 104-0032, Japan
Telephone: +81-3-5542-3101
Facsimile: +81-3-5542-3109
<http://www.sii.co.jp/segg/>