

## Two Part Tender (Technical & Commercial)

### Supply, Installation & Commissioning of Thermoelectric Quartz Crystal Microbalance (TQCM) at Prof.MGKML,CREST, Hosakote

Thermoelectric Quartz Crystal Microbalances, or TQCMs, are thermoelectrically controlled QCMs. They shall have an internal peltier heat exchanger which can either heat or cool the QCM to aid in both collecting condensables and then boiling them off later. They shall utilize a Peltier element to heat or cool the crystals to provide full temperature control. This feature makes the TQCMs very versatile.

It Shall be used in vacuum chamber / lab work, TQCMs are also shall have rugged design able to withstand shock and vibration.

#### QCM Controller

Control/Data Acquisition Unit shall be part of the system to acquire the data. Shall be suitable to measure different crystal frequencies like 15 MHz,25MHz,50MHz etc.,

It shall communicate with the host computer over industry standard RS 232/USB/equivalent. It shall accomodate both Si-diode and PRT temperature sensors, and will drive wire wound heaters, and both single and dual thermoelectric elements. Additionally, it shall be able to power and external heater, such as is used for an effusion cell.

While autonomously controlling the temperature, both temperature and frequency data for each channel are to be sent to the host over the serial link or standard link. The base unit shall handle four channels, expandable to 10/12 channels in steps of four. The data shall be sent to the host at a rate of one reading per second per channel.

The software shall include a simple to install and use, with an integral programming language which allows for simple command sequences.

#### Technical Requirements:

| Sl.No | Description  | Quantity |
|-------|--|----------|
| 01    | TQCM System consists of 66TR TQCM Controller for use with Model 56S/T or 36S/C Sensor. Temp control -199 ° C to +100 ° C ± 0.1 ° C. RS232 Port + 10ft cable. Computer/Manual control. Windows based LabWindows Software. 10 ft Sensor cable included. 1U x 19" Rack Mt, 220VAC 50-60Hz | 01       |
| 02    | Sensors: Model 56S/T TQCM Thermoelectric Sensor. -59 °C to +100 ° C operation. Platinum thermometer, two stage thermoelectric device, optically polished Au plated 15MHz Quartz  | 02       |

|    |   |    |
|----|---|----|
|    | Crystals.<br>Mass Sensitivity 1.96 x 10 <sup>-9</sup> g/cm <sup>2</sup> Hz  |    |
| 03 | Model 46E/T Electronics Module. 15 V sq wave output. Au Plated Housing. -55 °C to +100 °C operation   | 01 |
| 04 | 32 Pin Vacuum Electrical Feedthru on 2.75" Conflat. Lesker Part No. IFDRG327013. Shall Include AIR/VAC side Connectors 106CA Heat sink Au plate | 01 |
| 05 | Integration of vacuum feedthru into TQCM cable  | 01 |
| 06 | Additional cable length. Custom cable for use with 66TR controller. 13 Teflon insulated conductors + Teflon sheath. 4@18ga. 9@24 ga             | 01 |

- Measures molecular contamination in vacuum using a 15 MHz quartz crystal microbalance.
- Temperature range -59°C to +100°C.
- Mass sensitivity of 1.96 10<sup>-9</sup>g/cm<sup>2</sup>Hz.
- Dual quartz crystal beat frequency design minimizes temperature effects, allows for long cable runs.
- Thermoelectric (Peltier) device for sensor temperature control. ΔT ±70°C from its heat sink temperature.
- Easy installation for temperatures down to -20°C.
- Displays TQCM sensor temperature to 0.1 °C. Controls sensor to ±0.1°C.
- Displays TQCM sensor frequency to ±1 Hz.
- RS-232 port for data I/O and temperature control.
- Synchronized manual and computer temperature control.
- Displays Temperature Set Point with Activated or Deactivated status.
- Automatically detects TQCM or CQCM sensor type.
- 19" Rack mount.
- 240 VAC

Detailed Technical Specifications:

**Sensors**

| SI.No | Description  | Specification  |
|-------|--|--|
| 1     | Dimensions (56 S/T & 36S/C)                        | ~ 1.15" Dia, 1.25" Length.   |
| 2     | Connector (56 S/T & 36S/C)                         | Sensor has 8 Pin Male Connector -mates with 46E & 26E.                                     |
| 3     | Sensor Frequency (56 S/T & 36S/C)                  | 15 MHz.  |
| 4     | Sensor Crystals (56 S/T & 36S/C)                   | Two 15 Mhz, AT cut, gold plated, optically polished quartz crystals.                       |
| 5     | Sensitivity (56 S/T & 36S/C)                       | ~ 1 x 10 <sup>-9</sup> g/cm <sup>2</sup> Hz (15MHz base frequency).                        |
| 6     | Dynamic Range (56 S/T & 36S/C)                     | Solid film 50kHz +. Non-Solid 10-20 kHz.   |
| 7     | Base Frequency (56 S/T & 36S/C)                    | 1.0 - 1.5 kHz.   |
| 8     | Sensor Field of View Angle (56 S/T & 36S/C)        | ~ 140 °.   |
| 9     | Aperture Diameter (56 S/T & 36S/C)                 | ~ 0.25".   |
| 10    | Weight (56 S/T & 36S/C)                            | ~ 65 g.  |
| 11    | Temperature Sense Device (56 S/T & 36S/C)          | Wirewound Ceramic Platinum Thermometer 113Ω @ 0°C.   |
| 12    | Temperature Range Model 56S/T Thermo Sensor        | -55°C to +100°C.   |
| 13    | Temperature Control Unit Model 56S/T Thermo Sensor | Thermoelectric Device (TED) 2 Stage Peltier Provides ± 70°C ΔT from Heat Sink Temperature. |
| 14    | Thermoelectric Device (TED) Power Model 56S/T      | 10 W full cool. 7 W full heat.   |

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|----|---|--|
| 15 | Thermoelectric Device (TED) Current Model 56S/T | 4A Max Cooling, 1.4A Max Heating.  |
| 16 | Heat Sinking Requirements Model 56S/T           | 10W of Heat Sinking Dissipation Required with Heat Sink @+10°C and Sensor at -59°C (Max ΔT)<br><br>3W dissipation with Heat Sink @+10°C & Sensor@+25°C (ΔT = 45°C) |
| 17 | Temperature Range Model 36S/C Cryo Sensor       | -199°C to +100°C.  |
| 18 | Temperature Control: Model 36S/C Cryo Sensor    | Resistive Heater Element Shall Provide approx 200 °C ΔT above Heat Sink Temperature.   |
| 19 | Heat Sinking Requirements Model 36S/T           | Heat sink requires active cooling (LN2) to achieve low temperatures.   |

## Electronics

| SI.No | Description                        | Specification   |
|-------|------------------------------------|---|
| 1     | Electronics Module (46E/T & 26E/C) | Crystal oscillator electronics, provides beat frequency output from sensor crystals.        |
| 2     | Dimensions (46E/T & 26E/C)         | ~ 1.20" Dia, 1.60" Length.  |
| 3     | Sensor Connector (46E/T & 26E/C)   | 46E/T & 26E/C Electronics Module has 8 Pin Female Connector -mates with Model 56S/T & 36S/C |

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|----|---|---|
|    |   | Sensor.   |
| 4  | I/O Connector (46E/T & 26E/C)             | 13 Pin Amphenol JT02H-10-13P Mates with Cable Connector Amphenol JT06RE-10-13S.                 |
| 5  | Voltage Input (46E/T & 26E/C)             | 15V.  |
| 6  | Voltage Output (46E/T & 26E/C)            | 14.3V Square Wave.  |
| 7  | Supply Current Oscillator (46E/T & 26E/C) | 1 mA.   |
| 8  | Supply Current Internal Heater (26E/C)    | 20 mA.  |
| 9  | Weight (46E/T & 26E/C)                    | ~ 70 g.   |
| 10 | Internal Electronics Temp (46E/T & 26E/C) | Monitors electronics module internal temperature.   |
| 11 | Model 46 E/T Electronics Module           | Designed for use with Model 56S/T Sensor.   |
| 12 | Model 46 E/T Temperature Range            | -55°C to +125°C.  |
| 13 | Model 26 E/C Electronics Module           | Designed for use with Model 36S/C Sensor. Electronics Module is Thermally Isolated from Sensor. |
| 14 | Model 26 E/C Temperature Range            | -199 °C to +125°C. Uses 300mW internal heater to operate at LN2 temperatures.                   |
| 15 | Model 26 E/C Internal Electronics Heater  | Supplies ~ 300mW heating to 26E/C electronics module thru pin 10.                               |

## Controller

| Sl.No | Description          | Specification   |
|-------|----------------------|---|
| 1     | Dimensions           | Standard Rackmount, 19" Wide x 10" Deep, 1.75" Height (1U).                                       |
| 2     | Weight               | ~ 8 lbs.  |
| 3     | Power                | 230 Vac @ 0.4 / 0.2 A.  |
| 4     | Connectors           | TQCM Cable Connector - 10 Pin Amphenol MS3102A18-1P RS-232 9 Pin D-sub Data Port.                 |
| 5     | Software             | CVI/Labwindows Software for windows based PC. Stand alone executable program.                     |
| 6     | Temperature Control  | Controls<br>TQCM/CQCM sensor temperature to $\pm 0.1$ °C.   |
| 7     | Temperature Set      | Allows Manual Temperature Set Point Entry in 1 °C Increments, Synchronized with Computer Display. |
| 8     | Temperature Display  | Displays current TQCM/CQCM sensor temperature to $\pm 0.1$ °C.                                    |
| 9     | Temperature Accuracy | > 0.5 °C.   |
| 10    | Frequency Display    | Displays current TQCM/CQCM sensor frequency up to 500kHz $\pm 1$ Hz.                              |

|    |               |   |
|----|---------------|---|
| 11 | Sensor Status | Displays Temperature Set Point & Activated or Deactivated status. |
| 12 | Sensor Type   | Detects and Displays Sensor Type Thermo or Cryo.                  |

**Note:**

**1. Vendor shall provide the authorisation certificate from the manufacturer for the product offered.**

**2. Bidder should have supplied at least one such item in last five years. Bidder shall furnish previous references where similar systems had been supplied by him in past with details like contact person, address, PO value and brief specification achieved at the time of system acceptance by the customer.**

**Check list for No. of documents to be enclosed in the offer**

**a) Technical bid: Bidder shall furnish following details / documents in their technical bid:**

Detailed description of the system offered w.r.t. each of the above specification.

- i) Detailed list of scope of supply included in the offer.
- ii) List of major items along with make and model number.
- iii) Catalogues, leaflets, brochures, application notes etc. for all the major components and equipment's proposed.
- iv) Compliance table with remarks.
- v) Deviation table if any with remarks and detailed justification.
- vi) Un-priced commercial bid.
- vii) Any other details relevant to the requirement.

**b) Commercial bid: Bidder shall furnish following details / documents in their commercial bid:**

- i) Commercial bid with price
- ii) Price break up for sensor, data acquisition system, accessories etc.,
- iii) Price break up for Miscellaneous items if any (Include all left out elements giving details)