

Technical specifications for Source Measure Unit (SMU) and Electrometer

I. Source Measure Unit (SMU) Specification

- Supports two-channel configuration
- Minimum source resolution: 1 pA/1 mV,
- Minimum measurement resolution: 100 fA/100 nV
- Maximum output: ± 200 V, ± 3 A DC/ ± 10 A pulse
- Resistance Measurement Range < 200 M Ω
- Arbitrary waveform generation and digitizing capabilities from 50 μ s interval
- Integrated 4-quadrant source and measurement capabilities
- The 4" or bigger color display, should supports both graphical and numerical view modes
- SMU should be supplied with I-V Measurement Software compatible with windows-based PC. Its GUI should be usable with all interfaces (LAN, USB and GPIB).
- Max output power and source/sink limits 30 W or better
- Sense input impedance < 10 G Ω
- Sensing Modes 2-wire or 4-wire (Remote-sensing) connections
- Low terminal connection Chassis grounded or floating
- High throughput and SCPI command supporting conventional SMU command set
- Sweep measurement Number of steps 1 to 100,000; Sweep mode Linear, logarithmic (log); Sweep direction Single or double Type DC, or pulse
- Front panel operation with keypads and rotary knob; View mode: Single view & Graph view; Hard keys: Single Trigger and Auto Trigger control, 10-key, Rotary Knob and Cursors, Channel on/off, View, Cancel/Local; Softkeys: Function, System and Input Assist Keys; Indicators: Channel (measurement) status, System status.
- Digital I/O Connector type 25-pin female D-type connectivity, GPIB, USB front and rear & Ethernet 100BASE-T / 10BASE-T
- Operating environment 0 $^{\circ}$ C to +55 $^{\circ}$ C, 30 % to 80 % non-condensing
- Power supply 90 V to 264 V, 47 Hz to 63 Hz, 250 VA maximum
- Suitable Accessories for DUT connection
- Should provide all the necessary cables (of minimum 1 meter length) and connectors so as to control the SMU remotely using a windows based PC. Specifically
- Banana type plug cables should be supplied for 4 wire Kelvin connections.
- It should be supplied with a banana jack to triaxial adapter for 4 wires sensing.
- Supplier should provide 3 years warranty for the SMU.

II. Electrometer Specifications

1. Description of the ITEM:

One set of Electrometer with accessories for measuring very high resistance along with measurement and data acquisition software.

2. Detailed SPECIFICATIONS

A. Current measurement

- i) Range: Better than or equal to 0.01fA-20 mA with a minimum range of 2 pA
- ii) Resolution: 100 attoA or better at 20 pA.
- iii) No. of ranges: minimum of 10 ranges for a full range of 0.01fA-20 mA.
- iv) Input burden voltage: 6mV on 20 mA
- v) Accuracy: $\pm 1\%$ at 2pA

B. Voltage measurement

- i) Range: Better than or equal to 1 μ V-20V
- ii) Resolution: 50 μ V or better at 20 V.
- iii) No. of ranges: minimum of 2 ranges for a full range of 1 μ V-20V.
- iv) Accuracy: $\pm 0.025\%$ at 2V.
- v) Input bias current: < 20fA.
- vi. Input impedance:> 200 T Ω .

C. Resistance measurement

- i) Range: Better than or equal to 50 Ω -10P Ω
- ii) Resolution: 50 Ω or better at 20M Ω .
- iii) No. of ranges: minimum of 10 ranges for a full range of 50 Ω -10P Ω .
- iv) Accuracy: $\pm 0.2\%$ at 2M Ω or better.
- v) Auto voltage source: maximum of 400V

D. Charge measurement

- i. Range: Better than or equal to 10fC-2 μ C. Ability to measure in 4 ranges
- ii. No. of ranges: minimum of 4 ranges for a full range of 10fC-2 μ C.
- iii. Accuracy: $\pm 0.4\%$ at 2M Ω

E. Voltage source:1000V with resolution of 50mV or better at 1000V.

F. Digital display resolution: 6½ digits with alpha numeric display.

G. Triax to Alligator Cable for quick measurements for < 1nA, with at least up to 200V & 1.5m long

H. Triax Bulkhead Connector for flexible cabling, 200V

I. Low Noise Test Leads with 1.5 m length to measure accurate resistance up to 100 Gohms and voltage upto1,000 V

J. Pin Probes for high resistance measurement of small devices.

- K. Alligator Clips to hold DUTs with large terminals
- L. High resistance meter fixture adapter :Input / Output
 - i. Input connector: Three lug triaxial.
 - ii. Guard: switchable voltage guard.
 - iii. Analog output: 2V for full range input
 - iv. External trigger: facility with BNC input and output.
 - v. Output connector: banana jack or equivalent.
 - vi. 4-pin terminal plug for interlock connection
- M. Battery operation for AC power line noise-free measurements
 - i. Li-ion battery with integrated smart battery monitor and charger
 - ii. Battery operating time at least for 5hours
- N. Temperature and humidity: Meter should have provision for temperature and humidity measurement with suitable sensors.
- O. Reading buffer : 50,000 or more
- P. Interface: USB 2.0 compatible, GPIB IEEE-488.2 compatible.
- Q. Data reading rate up to 20,000 readings /s
- R. Operating power supply: 230 V AC \pm 10%, single phase, 50 Hz.
- S. Operating temperature: 18 °C to 45 °C
- T. Software: software for control, measurement and data acquisition
- U. Certification: Commercial Calibration Certificate with test data
- V. Optional accessories: Accessories for high resistance measurement and high voltage measurement individually quoted.
- W. User manual: In CD or hard copy.
- X. Warranty: Minimum Three year warranty

Terms and Conditions:

1. **The vendor should quote for both source measure unit (SMU) and electrometer.**
2. Manufacturer should have NABL Accredited Lab and Service/Calibration facility in India.
3. Bidders evaluation criteria: Qualified companies dealing with similar product of this nature over a period of 5 years only need to quote. Proof of supply / Performance (**atleast 5 Numbers of performance certificates/ proof of supply required may be mentioned**) statement of a similar products from any customer shall be provided along with the offer for evaluation.
4. Acceptance criteria: The item should be installed and demonstration of all features should be done at the customer's site and training shall be provided for 4 persons. Calibration of measurement parameters like current, voltage and resistance and the year of manufacture certificate should be provided.