



INDIAN INSTITUTE OF TECHNOLOGY MADRAS
Chennai 600 036

Telephone: [044] 2257 4467/9798/23
E-mail: tender@iitm.ac.in / arpp@iitm.ac.in



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Department of Physics

Corrigendum-3

Tender Reference no: PHY/JKRA/009/2018
Name of the Item: PV-IV Tester
Corrigendum details: Technical Specification revised

As informed earlier the technical specification for above mentioned tender has been updated. The venders are requested to submit their bids considering the updated specifications into account.

All other terms and conditions remain the same.

Tender Inviting Authority:

Sri. V. Sathyanarayanan

वि. सत्यनारायणन
V. SATHYANARAYANAN
वरिष्ठ प्रबंधक (परियोजना क्रय)
SENIOR MANAGER (PROJECT PURCHASE)
आई.सी एवं एस.आर / IC & SR
आई.आई.टी.मद्रास / I.I.T.MADRAS, चेन्नै / CHENNAI-600 036

Tender for PV-IV Tester

The system to be purchased should provide complete I-V measurement solutions for photovoltaic cells under light from a simulator (solar simulator not included).

1. I-V tester

1a. General specification

- The IV tester should be able to perform Dark & Light I-V on p-i-n type, n-i-p type, wafer based, glass substrate based, and flexible substrate based solar cells.
- The system should have Keithley based source meter with I-V software and cell connections to do IV measurement.
- System should run I-V measurements and calculate cell parameters such as short circuit current (I_{sc}), current density (J_{sc}), open circuit voltage (V_{oc}), fill factor (ff), maximum output power (P_{max}), cell efficiency (η), and other standard photovoltaic cell parameters; series resistance (R_{sc}), Resistance at open circuit (R_{oc}), shunt resistance (R_{shunt}), cell temperature, exposure duration, date and time.
- Software should have option of Viewing of multiple IV measurement results simultaneously.

1b. The I-V tester should meet following technical specifications.

- **Electrical Interface** 4-Wire
- **Communication Interface** GPIB - USB
- **Duration of I-V Measurement** less than 1 minute
- **Number of Measurement Points** 5-500
- **Operating System** Compatible with Windows 10 (32 or 64 bit);
Windows 7 (32 or 64 bit)
- **Software** LabView based application
- **Temperature sensor Accuracy** $\pm 0.25^{\circ}\text{C}$ at 25°C
- **Voltage Accuracy** $\leq 0.02\%$ average over all the ranges
- **Voltage Resolution** $1\mu\text{V}$ should be attainable
- Two types of source meters must be provided to perform I-V measurements on large area and small area cells respectively
 - (i) Source meter specification for large area solar cells measurement,
- **Output Power** max 50 W
- **Current Range** $10\mu\text{A}$ - 5A

- **Current Resolution** 100pA - 10 μ A
 - **Current Accuracy** <0.15 across all ranges
 - **Voltage Range** \pm 200mV - 40V
- (ii) Source meter specification for small area solar cells measurement.
- **Output Power** 20 W
 - **Current Range** 1 μ A - 1A
 - **Current Resolution** 10pA - 10 μ A
 - **Current Accuracy** \leq 0.3% across all ranges
 - **Voltage Range** \pm 200mV - 200V

2. Cell Holder Accessories: Specifications

- Cell holder should hold sample size of maximum 6 inch x 6inch square
- **Temp Sensing Range** : 10°C to 100°C, \pm 1°C
- **Temperature Holding** : < 0.5°C per minute with exposure to 1 SUN
- **Sample Temperature accuracy** : 0.25°C or better.
- Holder should be Vacuum Plate Material with proven conducting properties for homogeneous temp
- Holder should come with CE certified Chiller (item 4)
- Two Probes with XYZ adjustment. It should be able to use max 3 Amp current on each probe.
- Vacuum for holding of cells.
- **Vacuum pump**: Oil free

3. Ref cell and meter: Technical Specs

- **Range in which the cell is operable** 0-3.000 Sun
- **Power meter Resolution** 0.001 Sun or better
- **Voltage and current Sampling Rate** 2 Readings or higher/ second
- **Operating Temperature Range** 10 to 40°C
- **Operating Humidity** 0-80% RH

4. Chiller with pump : Specification

- **Operating Range** : 10 °C – 40 °C and Control Accuracy $\pm 2^{\circ}\text{C}$, temperature stability $\leq 0.10^{\circ}\text{C}$ with constant load
- **Communication Interface** : RS232
- **Noise** : <70 dB at 1 meter distance from the pump.
- **Tank Volume** : minimum 70 ml.

5. Other requirements

- **Warranty** : 1 year after installation
- **Electrical supply**: Indian standard ~220V, 50Hz
- **Service engineer** : Factory trained Service engineers must be available in india for IV Tester
- **Background** : Similar equipment at least in 4 labs working for >5 years. Addresses of references with contact details should be provided

6. Acceptance test :

- (i) Acceptable (Noise free) light I-V and dark I-V measurement (curve) of one standard solar cell from the vendor and one provided by the customer.
- (ii) A temperature dependent I-V measurement must be shown.