



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
 Powai, Mumbai 400076

Technical Specifications of Lab scale Lock in Thermography
(RFx No.610000095)

Description	Specifications
1. Major Application	Dark Lock-in Thermography (DLIT) analysis of solar cells of size 160 mm X 160 mm or smaller, and solar PV modules of 2 m X 1 m or smaller.
2. Sample Thickness	<ul style="list-style-type: none"> • Typically 200 μm for solar cells • 3 - 4 mm for PV modules
3. IR detector/camera	<ul style="list-style-type: none"> • Cooled InSb focal plane array • Spectral range: 2 – 5 μm • Detector format: 640 x 512 • Pixel pitch: 15 μm or smaller • Temperature resolution at 30°C: < 25 mK • Digitization: 13 bit or better • Frame rate at full frame: 350 Hz or higher • Integration time: 1 μs to 20 ms • Sub-window mode: Required. Please specify the options available on your system. • Appropriate power supply and control units for the camera. • The system to include appropriate cooling arrangements. The cooling arrangement, technology used and make and model of the cooling system should be specified in the quote. • For module measurements: <ul style="list-style-type: none"> ○ Field of view of 2 m x 1 m ○ Capabilities for measuring modules covered with solar glass with thickness of 3 - 4 mm from the glass side. • Appropriate lens(es) for cell and module measurements. The lens(es) focal length should be appropriate for measurements on both cells and modules. • Two separate filter and aperture wheels for automatic and flexible multispectral analysis such as on glass measurements.
4. Power Supply Requirements for DLIT and Biasing	<ol style="list-style-type: none"> 1. For cells: variable power supply with <ol style="list-style-type: none"> a. Maximum Current through the sample: +/- 16 A, programmable with an accuracy of 0.3% or better b. Maximum Voltage on the sample: +/- 30 V, programmable with an accuracy of 0.05% or better c. Display of the actual measured voltage and current 2. For modules: variable power supply with <ol style="list-style-type: none"> a. Maximum Current through the sample: 16 A, with a programming accuracy of 0.3% or better b. Maximum Voltage on the sample: 160 V



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	c. Display of the actual measured voltage and current
5. Sample mounting, sample size and camera mounting	<ol style="list-style-type: none"> 1. To include a chuck for the placement of cells for measurements <ol style="list-style-type: none"> a. The chuck should be large enough for placing atleast 160 mm X 160 mm, and smaller solar cells b. Vacuum to hold the samples 2. Appropriate Kelvin type probes for conventional Al-BSF and PERC solar cells with 4 bus bars and 5 bus bars front contacts. 3. Appropriate mounting for cooled camera.
6. Other requirements	<ol style="list-style-type: none"> 1. The system should include appropriate control and data acquisition hardware, and software for DLIT measurements. The software should have capabilities to control the power supplies. 2. Advanced DLIT analysis software with the following capabilities for cell measurements <ol style="list-style-type: none"> a. Local IV analysis. b. Capabilities for image capture and post analysis should have local emissivity correction and automated temperature drift compensation capabilities.
7. Computer and operating system	Quote to include PC with QWERTY English keyboard and monitor with appropriate hardware and software for the control of the measurement system, data acquisition and basic analysis. The operating system should be Microsoft Operating system released in 2010 or later.
8. AC power supply requirements	1. The system AC inlet should be compatible with Indian standards, i.e. 230 V for single phase and 440 V for 3 phase at 50 Hz.
9. Installation and Training	<ol style="list-style-type: none"> 1. Onsite installation and commissioning of the system from the original equipment manufacturer should be included in the quote. 2. The specifications of the system should be demonstrated after installation. 3. Appropriate training should be provided after successful installation of the system.
10. Other Information	<ul style="list-style-type: none"> • A list of essential consumables and spare parts for maintaining the system for 5 years should be provided and a separate quote for the same should be included. • Customer list in India and abroad with contact details (atleast 10) already using the equipment should be provided.