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

PR 1000052015 RFx 6100002670

Item Description: **High Precision Multichannel Battery Cycler**

Sr. No.	Item Description	Detailed Technical Specification	Technical Compliance (Yes/No)	Additional Information (if any)
1	**General Requirement**	The battery cycler shall be equipped with comprehensive hardware and software lock-out mechanisms that prevent unintended operation, ensure operator safety, and protect connected devices. The lock-out system shall comply with international electrical safety standards applicable to laboratory battery cyclers. • Rackable to accommodate the proposed configuration and with capacity for adding other instruments in the future – without sending back the equipment to factory • Stand-alone instrument: can operate without a PC (in the event of a system crash) • PC - Instrument communication: Ethernet • Native EIS		
2	**Hardware Features**			
2.1	**Channel Safety Relay (CSR)**	1- Each channel shall include an independent hardware safety relay capable of fully isolating the channel's output from the battery through: 2- Emergency Stop (E-Stop) a- Physically disconnect charge/discharge paths. b- Bring the system to a safe idle state. c- Require manual reset to resume operation.		
2.2	**Temperature**	1- Must support temperature probes per channel. 2- If any probe crosses user-defined limits, the system shall: a- Engage hardware lock-out. b- Disconnect the channel relay.		
2.3	**Environmental Chamber Support**	1- Provision for the cycler to support specific external environmental chamber 2- Operation through software.		
3	**Software**			

3.1	**User Access Control**	1- Multi-level password protection must be provided: a- Administrator b- Operator c- Viewer 2- Only authorized personnel shall start/stop tests, modify limits, or override lockouts.		
3.2	**Software Parameter**	Critical test parameters (current, voltage limits, cut- offs, step limits) shall be lockable to prevent modification during a running test.		
4	**Remote Access Capability**	Cycler must have the capability through remote access		
5	**Channel Specifications for 16 Channel Cycler**	Number of channels per module : 16 Cell connection : 4 terminal leads + Ground Compliance : -5 V to 5 V Maximum current : ±1.5 A Voltage control resolution : 150 µV Current control resolution : 8nA Maximum power (ch/dis) perchannel : 20 W		
		Voltage measurement: Ranges : -5 V to 5 V Accuracy (DC) : < 0.3mV±0.01% of setting Measurement Resolution: 40 µV Time base : 1 ms Acquisition speed : 1 ms Noise (peak to peak 0-1kHz) : 500 µV Slew rate : 150 kV/s		
		Current measurement: Max (continuous) : ±1.5 A per channel Ranges : ±1 A, ±100 mA, ±10 mA, ±1 mA, ±100 µA Accuracy (DC) : < 0.05% of value ±0.015% of FSR < 0.1% of value ±0.015% of FSR (1 A range) Resolution : down to 2 nA		
		EIS Buit-in : 10 kHz – 10 mHz		
		Electrometer: Input Impedance :50 GΩ || 6 pF typical Input Bias Current : < 1 nA Bandwidth (-3 dB) : 4 kHz		
		Number of channels per module : 8 Cell connection : 4 terminal leads + Ground Compliance : 0-9 V (Standard) Maximum current : ±15 A continuous/channel Voltage control resolution : 150 µV Current control resolution : 80nA Maximum power (ch/dis) perchannel : 105 W		

6	**Channel Specifications for 8 Channel Cycler**	**Voltage measurement:** Ranges : 0-9 V Accuracy (DC) : < 0.3mV±0.01% of setting Measurement Resolution : 40 µV Acquisition speed : 1 ms Time base : 1 ms Noise (peak to peak 0-1kHz) : 500 µV Slew rate: 3 kV/s		
		Current measurement: Max (continuous) : ±15 A per channel ±30 A, ±60 A or ±120 A, with channels in parallel Ranges : ±10 A, ±1 A, ±100 mA, ±10 mA, ±1 mA Accuracy (DC) : < 0.05% of value ±0.015% of FSR (±100 mA, ±10 mA, ±1 mA) < 0.1% of value ±0.015% of FSR (1 A range) < 0.3% of value ±0.04% of FSR (10 A range) Resolution : down to 20 nA		
		EIS Buit-in : 10 kHz – 10 mHz		
		Electrometer: Input Impedance :100 MΩ || 6 pF typical Input Bias Current : < 1 nA Bandwidth (-3 dB) : 4 kHz		
		Core: 1 Core : to control full system, 300Gb storage or better		
		Auxiliary Inputs / Outputs / Outputs: 1 analog input : ± 5 V - 18 bits resolution 1 Digital inputs : TTL level Trigger input 1 Digital output : TTL level Trigger output 1 Analog output : ± 5V - 16 bits resolution 8 Thermocouples inputs : Type K; Accuracy : ± 2°C; Measurement range : -25/200°C		
7	**Software Specificati on**	1- The control and data acquisition software must be available 2- It shall offer advanced control, monitoring, sequencing, safety, and analysis tools required for modern battery research.		

7.1	**General Requirement**	The software shall: 1. Control all channels independently from a single PC 2. Should have the internal storage facility within the module 3. Provide real-time visualization of current, voltage, temperature, and impedance. 4. Support multi-user, multi-role access. 5. Support parallelization of channels for higher currents. 6. Save all raw data timestamped 7. Allow remote operation 8. Safe data storage in the event of PC crash 9. Should have separate platform for configuration management (creation of the systems / upgrades / backups), testing, analysis and export of data's		
7.2	**Test Design & Control Features**	1- Techniques: CC / CV / CC-CV cycling (with switch in less than 2µsec)/ Voltage Scan / OCV / Loops / PEIS / GEIS / DCIR / G-ACIR / Ohmic Drop Compensation / Constant Power / Constant Load / … 2- Customisation: Arbitrary User Profile (AUP)		
7.3	**Safety, Lock-Out & Monitoring in BT- Lab**	The software must include built-in advanced safety features: **User-settable limits on:** 1- Voltage (upper/lower) 2- Current 3- Temperature (upper/lower) 4- Energy, capacity limits 5- Internal resistance rise limits **When any limit is breached, system must:** 1- Immediately stop the test **Software must store:** 1- User actions (start/stop/edit) 2- PC crashes and auto-recovery logs		
7.4	**Real-Time Monitoring & Visualization**	Software must include:Multi-Plot Visualization 1- Voltage vs Time 2- Current vs Time 3- Capacity vs Cycle number 4- dQ/dV 5- EIS (Nyquist, Bode magnitude, Bode phase) with fitting tools 6- Power, energy, SOC calculation		
7.5	**Data Export Formats**	Excel (.csv), text Data is never compressed or filtered; the software must save raw unaltered high-resolution data.		

7.6	**Device Integration Provision**	Environmental chamber interface through software		
7.7	**Data Acquisition & Export**	On Real Time		
8	**Services**	1- 1 year warranty 2- On-site Training 3- Calibration (Payable) 4- Local technical support 5- Local after-sales service		
9	**Recommended PC Specifications**	1- Processor Intel® Core i7 / Substantially Equivalent 2- 16 GB RAM 3- 1 TB Solid State Drive (SSD) 4- Screen resolution 1920x1080 5- Ethernet board 1000 base T 6- Windows© (64 bits)		