Technical Specification for Tender No. 2023-24/06 (Phase - II) Released Government E - Marketing (GeM Portal)

1. Solar Simulator		
Sl. No.	**Specification**	**Range / Value**
1	Type	Benchtop (Continuous mode with downward directional illumination)
2	Lamp	• 500 W xenon lamp or equivalent sources • One spare Xenon lamp must be quoted.
3	Effective Irradiated Area	150 mm x 150 mm or higher
4	Working Distance	200-300 mm from lens
5	AM filter	AM1.5 G must be included as standard
6	Irradiance	1,000 W/m² or higher (1-1.2 SUN): Output power must be adjustable upto maximum limit insteps.
7	Temporal Instability of Irradiance	<± 1% (JIS/IEC/ASTM Class A)
8	Irradiance Uniformity	<± 2% (JIS/IEC/ASTM Class A)
9	Spectral Coincidence	AM 1.5G (JIS/IEC/ASTM Class A)
10	Collimation Angle	< ± 3° or better

11	Lamp Life	1,000 hours minimum
12	Shutter Unit	Manual or timer controlled (0.1 S ~ 9990 Hrs)
13	Output Adjustment	By changing the current lamp power (70-100% or better）
14	Cooling Fan Motor	Auto-stop after the lamp extinguished over 20minutes
15	Interlock	Lamp should shutoff automatically when the lamp exchange door is open
16	Overheat Prevention Mechanism	Yes, 90°C thermostat inside the system
17	Lamp Hour Meter	Yes, Indicating operation time of lamp
18	Calibrated Reference cell and meter	NREL traceable reference Si mono crystalline solar cell with KG5 window. Appropriate connectors and a compatible readout meter for analog outputs for the sun irradiance and the temperature.
19	Source meter compatibility	The system should have relevant ports to connect to source measure units(Keithley 2450 or similar).
20	Attenuator for irradiance	Adjustable 10%-100%
21	Fixed attenuation filters	Mesh filters (10%-80%)

22	Temperature	25～30°C（RT value）
23	Humidity	20～85%（RH value No Condensation）
24	Probes	Gold-plated spring-tip probes should be provided for electrode contact - 04 nos.
25	Chuck	Vacuum hold-on compatible chuck should be provided.
26	Certificates	Certificate of Class AAA compliance with IEC 60904- 9, or ASTM E927, or JIS C 8912 must be furnished.
27	Inspection and acceptance	• The duly Authorized Representative(s)/ Scientists of the CIPET shall have the right, before payment, to inspect the Goods either at the OEM stores/during manufacture. The Supplier shall provide all facilities for such inspection. The CIPET may issue a written waiver of inspection. • Any inspection carried out by representative(s) of the CIPET or any waiver thereof shall be without prejudice to other provisions of the Contract concerning obligations assumed by the Supplier, including specifications of the Goods. • Upon delivery and inspection of the Goods, the CIPET shall inspect the goods as soon as possible and complete the Goods Receiving Document. Should any Goods fail to conform to the technical specifications, codes and standards under the Contract, the CIPET may reject the Goods. The supplier shall, at no cost to the CIPET, replace the rejected Goods or, alternatively, rectify the non-conformity. • In the case of Goods ordered on the basis of specifications or samples, the CIPET shall have the right to reject the Goods or any part thereof and terminate the Contract if the Goods do not conform to the specifications and/or samples. Nothing in this clause shall in any way release the Supplier from any warranty or other obligations under the Contract.
28	Warranty	Two years of comprehensive warranty from the date of installation without any additional cost to the purchaser. The warranty should cover lamp, circuits and other items including all accessories and spare parts.
29	Desktop system, printer and UPS	• A reputed brand desktop computer system with latest generation core i7 or higher processor • A reputed brand colour laser printer with scanner and copier functions. • One UPS with one hour power backup for the solar simulator system

30	Training	Vendor has to give 3 days on site application training after the installation by an expert

2. LC-HRMS		
Sl. No.	**Specification**	**Range / Value**
1	**LC system**	The system should capable of performing of HPLC/UHPLC separation to another level with the sensitivity and specificity of mass spectrometry. Analytical LC system should be provided for solvent and sample management with the following configuration.
1a	Pump	• High Pressure Binary pump having maximum pressure 15000 PSI or better. • The system should be capable of being operated as HPLC and UHPLC both compatible with columns of wide dimensions, up to sub-2-micron particle size or lower. • Capability of isocratic and gradient flow system. • Vacuum Degasser with sufficient number of channels. • Solvent delivery pump should be supplied with solvent tray, solvent bottles, filters, appropriate tubings and tool kit.
1b	Flow rate	· Must be 0.001 – 2 mL/min (in 0.001 mL increment) suitable for LC-MS/MS operation.
1c	Flow Precision	· Must be less than 0.07% RSD.
1d	Flow Accuracy	· Must be better than 1%
1e	Composition Accuracy	· +0.5% or better
1f	Composition range	· Settable range should be 0-100%
1g	Auto sampler	• It must be supplied along with loop for Analytical purpose. • Must be capable of holding 90 or more samples. • 1.5 mL vials (1000 nos) with caps should be provided with the auto sampler • It should have Peltier sample cooler from 4-40oC
1h	Column oven	· Temperature range: room temp. to 80^{o}C or better, which is capable of holding multiple columns.
1i	Detector	• Suitable PDA detector (190-800nm or more) with accuracy 1nm or better. • It should have dual light source with temperature-controlled flow cell
1j	Control	· Single point software control for both LC and MS system

1k	Columns	• HPLC columns and guard columns of C18 and C8 (<2um) 4 nos each. • Also, suitable columns to analyse peptide/ proteins/ oligonucleotide should be provided.
2	**HRMS system**	The system should have Quadrupole and Time of flight (Q-Tof)/Quadrupole with Time-of-Flight Equivalent technology for qualitative and quantitative analysis with the following configuration.
2a	Mass Range	• TOF: m/z up to 15,000 Da or more • Quadrupole: m/z up to 4,000 Da or better • The system should be able to cover all types of applications like Polymers, Oligos, biopharma, residues, drugs, metabolites, proteins, peptides, etc.
2b	Ionisation source	• Dedicated Electro-spray ionisation (ESI) source with positive and negative modes of ionisation. • ESI source permits switching between the two ionisation modes during a single run. • The cleaning of source must be done without venting the system. • Software controlled gas flow and heating facility. • ESI flow rate range without splitter: up to 2ml/min • Dedicated APCI source should be included
2c.	Mass resolution	• 30,000 FWHM or better for TOF. In case of equivalent technology other than TOF, the resolution of the mass analyser must be more than 1,20,000 FWHM or better
2d	Analyzer type	• Suitable analyser geometry which should have quadrupole as MS1 followed by TOF as MS2 with a collision cell in between should be present and capable of providing resolution 30,000 FWHM. • Detector should be equipped with the latest technology
2e	Mass Accuracy	• Minimum mass accuracy in MS mode must be 1ppm for internal and external standards (≤1.0 ppm in MS mode and ≤2.0 ppm in MS/MS mode)
2f	Mass Sensitivity	• Instrument should have sensitivity for standard sample (at picogram level) with S/N 500:1 (RMS) in MS or better and S/N 1500:1 (RMS) or better in MS/MS mode with proper documentation from company.

2g	Spectral acquisition rate	• Data acquisition rate must be 30 spectra/sec; 30 Hz or better in MS and MS/MS mode and for equivalent technology mass analyser of minimum 12 spectra or better with proper documentation from company. Higher spectral acquisition rate will be desirable.
2h	Temperature Stability	• Need to maintain 1 ppm accuracy even at temp of 18-28 oC for 24 hours
2i	Calibrant Delivery	· Provision for infusion of calibrant and reference compound.
2j	Reference /lock mass	• System should be capable of internal reference mass correction / lock mass for MS and MSMS operation. • Chemical reference kit for mass calibration should be supplied.
3	Vacuum System	• Highly efficient vacuum systems consist of turbo molecular pumps followed by rotary mechanical pump must be provide. • All accessories required for the proper functioning of the vacuum system should be supplied
4	Optimization	• Flexible automated optimization for protein, peptide, oligonucleotides and small molecule analysis.
5	Software/ Hardware system	• Branded PC with latest generation core i7 or higher processor, 16GB RAM, 3 TB Hard Drive, with 24-inch monitor, laser printer, work station facility, data handling and reporting with Licensed software for full control of the LC and MS systems. • Suitable software for instrument operation, scan and data processing of all scan function should be provided in CD`s with legal licenses. • The software should have the following features, a) Automated mass calibration, resolution, sensitivity check should be performed by software. • Elemental composition calculator for the HRMS data. • Simulation of isotopic pattern for a given molecular formula. • De-convolution tool for the determination of Mol. Wt. of high molecular weight compounds. • Appropriate software tools for addressing screening, compound identification and structural elucidation workflows. • Appropriate software for small molecules and nucleotide analysis that can perform both qualitative and quantitative analyses along with statistical tests, should be provided • Soft copy (PDF/ ASCII etc.) of all the operations and maintenance /trouble shooting manuals of the instrument and software must be supplied. • Free software upgradation for at least five years. • Both LC and MS should be from same manufacturer. • Should capable to integrating with other GC-MS and ionization source

6	Nitrogen generator and air compressor.	• A noise free Nitrogen gas generator with in- built compressor which is capable to deliver the 99.999% pure gas required to run the system. • Cooling moisture trap, all pipe/tubing connections and fittings will be done by vender.
7	Accessories	• Any other gas cylinders for the working of the system shall be provided with all accessories such as regulator, gas purification panel unit, cylinder cage / bracket etc. should be supplied and fitted with FOC by vender.
8	UPS	• A suitable online UPS of 10 Kva capacity or more with at least 60 min back up for the complete system (including LC) should be provided. • Battery and battery rack should be provided along with UPS.
9	Training/ Maintenance	• 05 days free training for technical operations and maintenance of the equipment at the time of installation by the expert and subsequent periodic training (two times/year) during the warranty period. • Service engineer should visit 2 times a year for annual maintenance of the system during the warranty period.
10	Inspection and acceptance	• The duly authorized representative(s)/scientists of the CIPET shall have the right, before payment, to inspect the Goods either at the OEM stores/during manufacture. The Supplier shall provide all facilities for such inspection. The CIPET may issue a written waiver of inspection. • Any inspection carried out by representative(s) of the CIPET or any waiver thereof shall be without prejudice to other provisions of the Contract concerning obligations assumed by the Supplier, including specifications of the Goods. • Upon delivery and inspection of the Goods, the CIPET shall inspect the goods as soon as possible and complete the Goods Receiving Document. Should any Goods fail to conform to the technical specifications, codes and standards under the Contract, the CIPET may reject the Goods. The supplier shall, at no cost to the CIPET, replace the rejected Goods or alternatively, rectify the non-conformity. • In the case of Goods ordered on the basis of specifications or samples, the CIPET shall have the right to reject the Goods or any part thereof and terminate the Contract if the Goods do not conform to the specifications and/or samples. Nothing in this clause shall in any way release the Supplier from any warranty or other obligations under the Contract.
11	Specification sheet	• A detailed specification sheet highlighting all above specifications along with detailed experimental conditions must be attached.
12	User Reference List	• At least 10 Global customer list with complete contact details should be provided.

13	Warranty	• At-least two years complete comprehensive maintenance warranty on the entire system (UPLC, HRMS, Nitrogen generator, UPS etc.) with spares, electronic boards and hardware consumables. • Warranty should include preventive maintenance kit, calibration kit for LC MS/MS system, and compressor of nitrogen generator without any further cost to the institute. • No conditional warranty will be accepted.

3. ICP-MS		
Sl. No.	**Specification**	**Range / Value**
1	Purpose	• ICP-MS system for elemental analysis which is the latest in the category and capable to deliver sub-ppb level analysis of element ions. System should be bench top model. • Trace and ultra-trace elemental analysis (ppm, ppb and ppt) in a single aspiration and in a single method.
2	Sample introduction system	Sample introduction system should comprise of peristaltic pump, nebulizer (Quartz or better), and spray chamber.
3	Plasma and torch setup	• Solid-state RF Generator: 27/40 MHz • RF power range: 500-1600 W or better • One-piece user-changeable quartz torch with alignment: X, Y, Z automatic and computer controlled • Should have at least 04 mass flow controllers (MFC) for control plasma, auxiliary makeup, carrier gas and makeup/ dilution gas
4	Detection Limits	• Be or Li: 1 ppt or better • In or Y: 0.5 ppt or better • U or Tl: 0.5 ppt or better
5	Sensitivity	• Low mass (Be/Li): ≥50 Mcps/mg/L • Mid Mass (In/Y): ≥150 Mcps/mg/L • High Mass (Tl/Bi): ≥80 Mcps/mg/L
6	Oxide ratio	• (CeO+/Ce+): <2%
7	Mass range	• The mass range should be from 5-280 amu or broader.
8	Vacuum system	• Suitable turbo molecular pump, corrosion resistant and protected. • Vacuum should be maintained even in case of a power failure or the system should be backfilled with inert gas to prevent damage to collision/reaction cell
9	Control	• Fully automated and software driven switching of reaction and collision gases or pre-mix gas.

10	Essential Supplies	• 1000 ppm NIST Certified Multi element (at least 23 elements) aqueous calibration standard (100 mL). • Fume hood with accessories. • Argon Gas Cylinder – 3 no's • Helium Gas Cylinder – 1no. • Reaction Gas Cylinder like Oxygen, Hydrogen & Ammonia 1 no. each • Gas Regulator with Gas Panel for all the gases mentioned above – 1 no. each
11	Microwave digestion system for sample preparation	• Microwave digestion system: capable of digesting inorganic/organic samples including metals, alloys, geological samples, glass, quartz, ceramics, ashes, plastics, electronic products, fibers, oils, waxes, coal, coal ash, soil, sediment, sludge, aerosol, water and wastewater, biological samples, pharmaceuticals, chemicals, etc. • The system should have 14 or more vessel rotor, microwave power ≥ 1600 W, vessel volume: ≥80 ml, maximum operating temperature: ≥ 240°C (designed temperature ≥300°C), maximum operating pressure: ≥ 50 bar (designed pressure ≥100 bar), IR/contactless temperature sensor for temperature monitoring of each vessel, integrated keypad/touch screen control, pressure-activated venting, chemical- (especially, acid) and corrosion-resistant cavity chamber and vessels, TFM/PTFE vessels, flexibility in terms of customized method creation, compliance with international safety standards, and method compliance with ASTM D4309-96, ASTM D-5765, ASTM D-6010-96
12	Training	• Vendor has to give 5 days on site application training after the installation by an expert
13	Inspection and acceptance	The duly Authorized Representative(s)/ Scientists of the CIPET shall have the right, before payment, to inspect the Goods either at the OEM stores/during manufacture. The Supplier shall provide all facilities for such inspection. The CIPET may issue a written waiver of inspection. Any inspection carried out by representative(s) of the CIPET or any waiver thereof shall be without prejudice to other provisions of the Contract concerning obligations assumed by the Supplier, including specifications of the Goods. Upon delivery and inspection of the Goods, the CIPET shall inspect the goods as soon as possible and complete the Goods Receiving Document. Should any Goods fail to conform to the technical specifications, codes and standards under the Contract, the CIPET may reject the Goods. The supplier shall, at no cost to the CIPET, replace the rejected Goods or, alternatively, rectify the non-conformity. In the case of Goods ordered on the basis of specifications or samples, the CIPET shall have the right to reject the Goods or any part thereof and terminate the Contract if the Goods do not conform to the specifications and/or samples. Nothing in this clause shall in any way release the Supplier from any warranty or other obligations under the Contract.

14	Warranty	• Two years of comprehensive warranty from the date of installation without any additional cost to the purchaser. The warranty should cover ICP-MS, LC unit, microwave digestion system, UPS, and other items including all accessories and spare parts.
15	Computer	• A suitable branded computer with latest generation core i7 or higher processor for system control & data acquisition.
16	UPS	• Suitable online UPS having at least 1 Hour battery backup should be supplied.
17	Chiller	• Compact Chiller should be supplied.
18	Additional Accessories	• (Concentric Nebulizer, Sample cones, Skimmer cones, Spray chamber, Torch, Injector, Sample tubing for nebulizer, Tubing for spray chamber drain, Sample uptake tubes, Sample drain tubes)-One set each

4. Free Hand Scanner		
Sl. No.	**Specification**	**Range / Value**
1	Field of Application	The Portable Scanner will be used for Quality Control & Inspection, Reverse Engineering
		The Portable Scanner will be used for Comparison of actual data with nominal data (part to CAD)
		The Portable Scanner will be used for Comparison of actual data with actual data (part to part)
2	Technical Data	3D scanning system with multiple laser lines.
		Scanner should have Ultra Fine Scanning Mode with extra parallel laser lines
		Scanner should be able to scan with or without Marker or sticker
		Real time display should be possible on secondary device
		Measurements Rate Should be minimum 4,00,000 measurment/sec
		Scanning Area minimum 220 x 240mm
		Light Source at least 7 Blue laser lines
		Class 2 Laser or better
		Accuracy minimum 0.04mm
		Volumetric Accuracy: 0.04+0.08mm/m
		Resolution up to 0.06 mm
		Standoff Distance 350mm ± 50mm
		Should not require rigid mounting - only handheld operation
		Should be Battery operated with a backup time of min 6hours
		Scanner Weight: 1Kg or below
		No Requirement of Rigid Mounting
		Operating Temp:15-40°C or better
		Humidity: 10-90% (Non Condensing)

3	Scanner construction features	3D Scanner should be of rigid, Portable type construction having good quality lenses life cycle with scratch free or protective glass.
		All direction measurement systems should be vibration free/ maintenance free/ Backlash free.
		3D scanner should be able to scan in all planes, Holes, Cylinder, Rectangle, Curves, Edges and Shapes (including inclined planes) with suitably assembled configuration with auto corrections
		3D Scanner should be supplied with certified calibrated Master required for regular machine calibration.
		3D Scanner should have Measuring Range detection technologies
4	Essential Accessories / Attachment	Computer system Laptop : Branded Processor : Xeon or i9 High-end Latest Generation Ram : 64GB Graphic Card : 16 GB minimum Hard Disk : SSD 4TB minimum
		USB Keyboard kit with multi tasking mouse (English) and mouse pad. Keyboard and mouse water and dust resistant as per international protection rating
		Set of any other Essential Accessories / Equipment required for normal running of machine must be quoted clearly by the firm. Detail list must be attached in attachment.
		Electrical equipment suitable for operation on 230 volts +/- 6 %, single phase 50+/- 3% VAC. /3 Phase 415 /385 v to be specified.
		The equipment should be designed so as to provide for easy maintenance / repairs of all parts. Also firm should ensure the availability of spares
		Important parts of Machine like scanner, Lenses, controller should be from same manufacturer.

5	General Requirement	All Software should be a authorized , updated and of latest version from reputed company who is supplying above software's to the reputed world class 3D scanner manufacturer.
		Adequate protection should be provided for all components against possible damages.
		The equipment should be manufactured and processed in accordance with good design and aesthetic sense and sound engineering practice and to the entire satisfaction of the inspection authority.
		Accessories, if any, should be quoted item wise and to be attached.
		Maximum turnaround time in case of machine breakdown & subsequent duration of Fix with measures: Two working days
		All machine spare parts should be available at local supplier.
6	Pre-Dispatch Inspection	Pre -dispatch Inspection will be carried out by the Buyer's Representative at Firm's premises as per standard test chart submitted by the firm in the bid. Certification for all parts of the machine is required.
7	Final Inspection	Firm has to send detailed Self inspection report and valid calibration certificate along with machine.
8	Training	Basic and Advanced Training is to be concurrently imparted in CIPET in the areas of operations, maintenance and software application by the firm for a period of minimum 6 working days.
		Expert training to be arranged by the firm after 6 months of installation at no additional cost for a period of minimum 3 working days.
9	Programming Support	Experts support required for 1 year **Online or Offline** at no additional cost whenever required.
10	Special Instruction	The tenderer shall provide detailed catalogue of the machine offered.
		Manufacturer should have supplied atleast 5 machines in India.
		The supplier should furnish quantitative values clearly in the technical quote with respect to the specified values in the technical specification, instead of mentioning "Complied", "Agreed", "Confirmed", etc. otherwise, the offer is liable to be rejected.

11	Ethernet Port / LAN Port / PROFINET	Additional Ethernet & Profinet port required to connect to local server for Quality Cockpit and Machine shop machines integration
12	Software	
12.1	Output format	Software should support at least 12 standard formats like OBJ, PLY, WRL, STL, AOP, ASCII, PTX, E57, XYZRGB. Software must support a raw data export in. scan format.
		Point cloud format – PTX
		Measurement - CSV, DXF, XML.
12.2	OS Support	Windows 10, 64 bit with Multi core processing
12.3	Automated-Data Processing	Software should support defeature tool to automatically erase imperfections and fill holes with one click operation. Software should be able to guide through the steps and analyze data to build the best possible scanned data.User should have an option to select single click complete automated processing workflow from aligning the frames to the final polygonal model.
12.4	Measurement Tools	Software should have measurement tools for Linear, geodesic Volume measurements, annotations, DXF export
12.5	Noise Filter Features	Software should have customizable 3D noise filters. It should automatically delete the flat background on the scanned objects (i.e., base / noise), to minimize manual erasing process.
12.6	Mesh Simplification	Software should support simplifying to reduce no. of points of the mesh based on the application before exporting to any output format.
12.7	Bridge making	Software should have option to make bridge in missing aera to create the best possible STL data.
12.8	Additional Tools	Software should have option of creating a mirror, scaling, defeature tools for easy processing if required.
12.9	3D parametric model	Scan based 3D parametric modelling software. Professional version with perpeutal license
12.10	3D Inspection software	3D and 2D inspection with GD&T measurements. Professional version with perpetual license
12.11	3D Inspection Tools	Scanning Software should support importing CAD (STEP, IGES) model for quality inspection by comparing with scan output supported by colored visualization with changeable Tolerance band.

12.12	Section creation	Software should have option of creating 2D section from the STL data in the scanning software itself.
12.13	CAD formats	Scanning software should support creating editable primitives like Plane, Cylinder, Cone, Sphere, and Torus from the scan model which can be exported in CAD formats like STEP, IGES.
12.14	3D Surface creation	Scanning software should support extracting Freeform surface by selecting 3D profile from the scan data which should be exportable to STEP and IGES.
12.15	Editing Meshes with the CAD objects	The scanning software should support Boolean operations (Merge, Subtract and Intersect) between CAD surfaces and scanned mesh model for any quick correction of the scanned model to avoid dependency of the third-party software for splitting, merging the meshes.
12.16	Uploading scan models to web GL	Accessibility to upload the scan models directly from the scanning software to secured web graphics library, publicly or privately for reviews and comments.
13	Technical updates	Availability of information on technical update such as updated software, case studies, feedback from other customers etc. for effective utilization of the system on a regular basis.
14	Documentation	Operational Manual (User Manual)
		Software Instruction Manual for Parametric Design and Inspection Software
		Maintenance and troubleshooting Manual
		Training Manual
		Installation and Commissioning
		Handling of accessories
		Software perpetual License key
		Software CDs/ USB drive
15	Accessories to be quoted and supplied along with machine / equipment	Antivirus, Webcam, Consumable Spray, UPS 3 KVA etc should be quoted. Any other Accessories, if available for better utilization , Bidder to specify and quote
16	System	The System shall be catalogued items from a company. All the relevant catalogues shall be enclosed in the technical bid.

17	Scope of supply	Attach list for scope of supply
18	Installation requirements	Bidder to specify , pre-installation requirement
19	Installation &Commissioning	Bidder should bring necessary items, consumables for Installation and Commissioning.
20	Technical support and service	Availability of technical support in the area of application and service both within the country.
21	Warranty	The supplier should provide warranty for at least two years for replacement and service against any design, manufacturing and workmanship defects , PARTS AVALIBILITY/ SUPPLY 07 Years Assurance under AMC Post warranty

5. 3D Printing Filament Extruder with Accessories		
Sl. No.	**Specification**	**Range / Value**
1	Purpose	Compact parallel co-rotating twin screw extruder for lab scale to develop precise 3D print spools/filaments such as PLA, PET, ABS, PVDF, Nylon, PC, PP, fiber/filler reinforced composites, Elastomeric & Ceramic related samples, etc. Filament measuring and control unit with closed loop for precise adjustment of the 3D filament diameter.
2	Barrel	• Barrel length: 11 mm or 12 mm • L/D ratio: 36:1 or 40:1 Co-rotating twin screw extruder for compounding small polymer and additive quantities. Incorporation of fillers, blending, and reinforcing with fibers suitable for powders, liquids, micro granules, and standard granules up to 3mm diameter production simulation and scale-up possibility on the mobile base frame.
3	Screw speed	Up to 700 rpm or higher
4	Torque per shaft (Minimum)	6 Nm or better
5	Pressure (Max)	100 - 150 bar
6	Operating Temperature	400 °C or higher
7	Feed zone	Permanently water cooled with refrigerated chiller to be included. The extruder should have an in-built water distribution system. Suitable water circulation cooling system should be provided.
8	Heating zones	Minimum 4 heating / cooling zones with electrically heated water or air cooling

9	Extruder Drive/ control/ software	Controller shall have an integral coloured touch screen for monitoring of the following parameters: • Extruder speed (rpm) • Extruder torque (%) • Barrel temperatures (Deg. C) • Pressure (bar) • Volumetric/Gravimetric feeder speed (%) • Able to monitor the filament diameter
10	Feeding systems	Minimum 3 nos. Feeding zone – One for polymer, and others for powders/fillers/additives/liquid/vacuum/venting purpose
11	The extruder should be supplied with a 3D strand die	Strand diameter can be easily altered using various sets of die inserts (0.5, 1, 1.5, 1.75, 2, 2.5, 3 mm). Should allow quick change of the die diameter. Should contain a set of threaded die nozzle (0.5, 1, 1.5, 1.75, 2, 2.5, 3 mm).
12	Throughput	Minimum 2.5 kg/hr.
13	Post Extrusion systems	The extruder should be supplied with post-extrusion accessories like a water bath, spooler, and laser diameter measuring system to take up, measure, and wind up the strand for 3D printing. The spooler must be compatible with extruder die height and must have the following specifications: • Adjustable line speed with self-adjusting compensation for spool diameter. • Filament distribution traverse with settable travel to compensate spool width. • Filament diameter: 1 - 3 mm or Better • Line Speed 0.5 - 15 m/min or better Laser diameter measuring system: • Suitable high precision laser systems for online quality verification of filaments. • Should be capable of identifying the variation in diameter while extruding to maintain the desired diameter • Fully automatic closed-loop control technology for precise control of filament diameter. • Device shall be software integrated for automated diameter control with downstream Equipment • Highly accurate mean value, independent of the orientation of the product ovality • Accurate value also for circumference and cross-section
14	Accessories	Toolbox- 1 set Purging kit-1 set Compressor as per the requirement-1 no. Spares should be available for the smooth running of the extruder for a minimum of 02 years.
15	Vacuum system	Compatible vacuum system to be provided with extruder

16	Chiller	Suitable refrigerated circulator chiller to cool and maintain the temperature of the extruder zone should be provided.
17	Sheet Die for Twin Screw Extruder	Complete sheet die set-up with temperature controller, die heater, and flow channel for 1. Horizontal wide sheet (minimum 50mm) with adjustable slit height (0.05 to 2 mm) compatible with the extruder. 2. Temperature: 400 °C or better. Temperature is controlled via a separate controller. 3. Modification of slit height for flexible sheet die 4. Separate blower or compressed air. Sheet Take Off for Twin Screw Extruder 1. To smooth and take off extruded sheet and ribbon samples in a defined manner. Easy handling due to cantilever-mounted rolls. 2. Two driven chill rolls (oil/water cooled) to take the sheet from the die. 3. Two rubber stretching rolls. The speed of the rubber rolls can be controlled separately within 0-10 %. 4. Wind Off roll with interchangeable rolls with self-adjusting speed to compensate for the increasing roll diameter.
18	Tubing Die	Tubing Die Assembly for extrusion of Tubes. Interchangeable Die inserts: ID Ø: 2 mm/ OD Ø: 4 mm to ID Ø: 8 mm/ OD Ø: 10 mm- any 02 Nos
19	Pelletizer for extruder	Strand Cutting Variable Length Pelletizer; with variable speed drive and adjustable pellet length. With an opening panel for easy-cleaning access, fully safety-interlocked and complete with electrical controls.
20	Vacuum Oven with dry vacuum pump	• Vacuum oven with a capacity of 100 L and a temperature of 200 °C or better, & minimum of 2 shelves should be supplied. • SS 316L Frame Structure. • Double wall hinged door with Glass inspection window for process monitoring inside the chamber. • Suitable sealing to achieve the required vacuum. • Controller with digital display for monitoring pressure and temperature. • Program-controlled drying and monitoring with automatic ventilation at the end of the process. • Dry Vacuum Pump suitable to achieve the required vacuum. o Provision of in-built non-return valve. o Flexible hose to interconnect the pump and oven. o Moisture trap system shall be provided. o Inert gas connection should be included. Required mandatory accessories to be supplied with this including vacuum pump, gauges, flanges, etc.

21	High-Temperature sintering Furnace	Curing and drying in inert atmosphere furnaces up to 1800 °C. Capacity: 30 L or more Furnace construction: 1. Dual shell housing with fan cooling for low shell temperatures 2. Chain-guided parallel swivel door for defined opening and closing of the door. 3. Heating from both sides via molybdenum disilicide or equivalent heating elements Heating element 1. Molybdenum disilicide or equivalent 2. Original manufacturer test certificate should be provided. 3. Controlled by solid state and thyristor relays for very precise temperature control, wear-free and noiseless Standard Working Temperature: 1750 °C Maximum Working Temperature: 1800 °C Temperature Control: Programmable PID Temperature Controller Cum Indicator and Timer for Temperature direct indication Heating Rate: The furnace should be of fast heating type with the maximum attainable temperature that should reach a ramp function in less than one hour. Temperature Accuracy: +/- 1 °C at the center of the zone. (Original manufacturer test certificate should be provided) Thermocouple: Type B thermocouple or better (Original manufacturer test certificate should be provided) Thyristor: Heating elements switched via thyristors (Original manufacturer test certificate should be provided) Type of Insulation: 1. Refractory brick floor insulation for a higher floor load (Tmax - 1700 °C) 2. High-quality fiber insulation backed by special insulation 3. Long-life roof insulation with special suspension Gas purging facility: N2 or Ar with solenoid valve and rotameter, controlled by the extra function of the controller. Required mandatory accessories to be supplied with this.
22	Microprocessor-controlled injection molding machine to produce test specimen (Please enclose complete specification)	Micro injection molding machine to produce test specimen with a minimum amount of sample material. The manufacturing process is completely micro-processor controlled. Technical data: 1. Injection capacity Minimum (cc): 12.5 2. Melt temperature: 400 °C or better 3. Injection pressure: 1100 bar or better 4. The requirement for compressed air supply should not be more than 10 bars 5. Mold for Tensile bar ISO527-2-1BA 6. Mold for Tensile bar type 4 as per ASTM D638 7. Mold for disc diameter 20 mm, height 1.5 mm 8. Mold for disc diameter 25 mm, height 1.5 mm 9. Mold for disc diameter 35 mm, height 1.5 mm 10. Mold for disc diameter 50 mm, height 1.5 mm 11. Mold for Tensile bar ISO527-2-5A 12. Mold for flexural specimen as per ASTM D790 13. Mold for bar 80 x 10 x 4 mm Izod ISO180, Charpy ISO179-1 14. Mold for DMA test bar L = 60, w = 10, h = 1 mm
23	Software	• Compatible with Windows 10 or higher • Required system controlled through using appropriate software and interphases for quick and reliable data acquisition and analysis. • Upgradable software for complete data analysis/programming.

24	Personal Computer (PC)	02-Nos-A Personal Computer having latest configuration: i7 processor 10th generation, 16GB RAM, DVD - RW, 500 GBSSD, Windows 11 with lifetime licence, Latest microsoft Office professional, 27"LCD display, Wifi enabled or with better specifications. The scope of supply also includes a good (reputed make, please give the details) colour Laserjet Printer having a resolution of 1200 × 1200 dpi or better.
25	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above: • Hard copies of Operational & Service Manual - 01 Set. • Machine should come with all other essential accessories & spares required for installation, commissioning & Operation. • Onsite Training is to be provided to the CIPET officials at the commissioning site.
26	UPS	• Suitable 02 Nos of UPS for 1 hour or higher power backup (2 years warranty on UPS and 2 years warranty on batteries) for extruder set-up and injection moulding set-up.
27	System Warranty	Minimum 2 years
28	Maintenance	The system should come with an initial annual maintenance cover (AMC) for a minimum of 02 years after the completion of the warranty period.

6. Pouch Cell Fabrication Facilities		
Sl. No.	**Specification**	**Range / Value**
I. Precision Die Cutter		
1	Maximum punching size	280 x 180mm (Die should be included)
2	Punching accuracy	± 0.1 mm or better
3	Booster cylinder	3T
4	Die cutting stroke	150mm or better
5	Vertical burr	≤ 15μm
6	horizontal burr	≤ 20μm
7	Long service life of the knife die	normal use ≥ 30,000 times
8	Compressed air	0.5 MPa ~ 0.8 MPa

9	Power supply	AC 220V, 50/60 Hz
II. Cup Forming Machine		
1	Gas source	0.5 - 1MPa
2	Mould Material	SS 136 Die steel or better
3	Forming size	Double pit foldable (with air bag): L40 x W35mm (air bag should not flush pit width 50 mm) Single pit folded in half (airbag): Max. L61 x W47mm (airbag should not flush pit width 50mm) Single pit four-sided seal (with air bag): Max. L80 x W35mm (air bag should not flush pit width 50mm) Single pit four-sided seal (no air bag): Max. L80 x W65mm (long margin 40mm, short margin 30mm)
4	Forming pressure	Max. 0.6T
5	Die pressing pressure	Max. 0.7T
6	Depth of the pit	Max. 6mm, related to the material and thickness of aluminum plastic film
7	Forming accuracy	± 0.05 mm
8	Main feature	• Should possess an aluminum plastic film molding with appropriate thickness, suitable for sampling, research, and development • Should possess an adjustable molding pressure and molding speed • High-strength frame should be provided with upper and lower precision templates to ensure molding accuracy • The molding products should possess a uniform, high tensile effect with no strain, or rupture • A set of standard-size molds to be provided. Also, it should be customized according to our requirements.
9	Power supply	AC 220V, 50/60 Hz

III. Semi-automatic electrode stacking machine		
1		• Anode and Cathode electrodes should be alternately stacked with the separator film in between. • The machine should have automatic lifting and placing of the electrodes in the stacking position function. • The machine should possess an automatic counting of stacking numbers and manual zeroing. It should also be designed with a digital display counter. • The machine should have PLC-driven touchscreen control for all the functions. • Electrodes should be placed manually and the fixture should be used to assist the positioning to ensure the uniformity of the stacking for different electrode dimensions. • The machine should have an in-built vacuum pump to pick up the electrodes automatically. • It should be able to accommodate a wide variety of electrode dimensions. • One standard stacking module (including a protruder) should be included along with the machine. **Alignment accuracy: ≤0.5 mm** **Separator width: ≤100 mm** **Maximum separator roll: φ200 to 250 mm** **Applicable electrode size: L 60 – 100 mm, W 50 – 100 mm, H 2 – 8 mm** **Stacking layer: 500 layers** **Tab length: ≤ 25 mm** **Swing roll travel: 180 mm** **Air pressure source: 0.5 MPa ~ 0.7 MPa** **Vacuum pump: In-built vacuum pump** **Power supply: AC 220V, 50/60 Hz**
IV. Pouch Cell Top and Side Sealing Machine		
1	Features	• The temperature of the upper and lower heads should be adjustable through the thermostat panel. • The head should be made of copper material, which should have a good heat transfer effect. • The upper and lower heads should be driven by a cylinder and guided by two linear guide sleeves, which can move up and down flexibly. • The guidance should be accurate to ensure the parallelism of the product after edge sealing • The products should possess a uniform, compact, and smooth sealing.
2	Maximum sealing length	200 mm or higher
3	Sealing width	5 mm or higher
4	Side sealing thickness	60 – 300 µm
5	Top sealing thickness	200 – 700 µm
6	Seal thickness	150- 300µm

7	Sealing Pressure	0 ~ 0.7 MPa
8	Sealing Temperature	RT ~ 250 °C
9	Temperature accuracy	±2 degree °C
10	Air Consumption	0.1 – 0.2 L/sealing
11	Sealing time	2 – 3 sec (adjustable from 0 to 99 seconds).
12	Pneumatic operating speed	≥180 time/hour
13	Sealing knife	Copper material
14	Power supply	AC 220V, 50/60 Hz
15	Accessories to be quoted and supplied along with machine/equipment	All necessary connectors, and cables required for the operation should be provided.
V. Pouch Cell Vacuum Sealing Machine after Electrolyte Injection		
1	Features	• The head should be made of copper material, which should have a good heat transfer effect. • The upper and lower heads should be driven by a cylinder and guided by two linear guide sleeves, which can move up and down flexibly. • The guidance should be accurate to ensure the parallelism of the product after edge sealing • The cover cavity should be driven by a cylinder, guided by a rotating guide sleeve, and should move up and down flexibly. • The guidance should be accurate to ensure the sealing requirements of the product. • It should be small in size and lightweight with PLC touchscreen control. • It should be easy to operate

2	Application	Should be used for sealing aluminium-laminated cases after undergoing top and side sealing. The final sealing operation should be done inside a glove box.
3	Material	The chamber should be anticorrosive and it should be made of aluminium alloy.
4	Vacuum degree	95 KPa or better
5	Sealing Head Temperature	Room temperature ~ 250℃, adjustable
6	Temperature Accuracy	±3 degree C or better
7	Heat sealing pressure	0~7 Kg/cm^2
8	Heat sealing time	0~99 second, adjustable
9	Maximum edge sealing length	200 mm
10	Seal thickness range	60 ~ 300 μm
11	Air compressor working speed	≥180 times/h
12	Air consumption	About 0.2 L compressed gas/every time sealing.
13	3 in 1 Function	The instrument should also have 3 in 1 functions such as Pouch cell top & side heat sealing before electrolyte injection; Pouch cell vacuum standing for electrolyte diffusion; Pouch cell vacuum hot sealing.
14	Power supply	220V AC, 50Hz
15	Compressed air source	0.5 ~ 0.8 MPa
16	Accessories to be quoted and supplied along with machine/equipment	A Suitable Feed-through with all the necessary wires, tubes, and connectors should be included to allow operation inside the Glove box.
VI. Ultrasonic Welding Machine		

1	Ultrasonic metal welder should be used for welding stacked electrode sheets (copper and aluminium) and tab onto current collectors to prepare Li-Ion pouch cells. • Input Voltage: 220V AC Single Phase, 50/60 Hz • Max. Power Consumption: 0 - 800W, adjustable • Welding Area: 3mm (L) x 3mm (W), should be customized according to the customer's requirement. • Touch Panel Control • Welding Head: Two welding heads and two welding bases should be included. • Welding Craft 1: Welding pure Al tab 0.1mm + pure Al foil 0.012-0.018 mm within 20 layers • Welding Craft 2: Welding pure Ni tab 0.1mm + pure Cu foil 0.012-0.018 mm within 20 layers • Ultrasonic Frequency: 40 kHz or higher, Auto tuned • Welding time: 0.01 ~ 2 seconds. • Working Mode: Pneumatic program control • Working air pressure: 0.2 MPa – 0.7 MPa • Controller: 550mm (L) x 300mm (W) x 550mm (H) • Welder: 480mm (L) x 240mm (W) x 385mm (H)

VII. Battery/Supercapacitor Cycle tester

Battery Cycle tester for testing the charge/discharge behavior of coin/pouch type battery and supercapacitor cells

1	Application Includes	Battery, Supercapacitors
2	No. of channels required	Independent 8 channel
3	Voltage Range	0 – 5 V or Higher
4	Current Ranges	0.5 mA – 1 A or better
5	Operation Modes	Constant-Current (CC) Charge, Constant-Current (CC) Discharge, Constant-Voltage (CV) Charge, and Cycle life test. Constant Power/Resistant Charge or Discharge
6	Current Accuracy (supply and measurement)	Maximum: ± 0.05% Full Scale + 0.05% Reading or better Typical: ± 0.03% Full Scale + 0.03% Reading or better
7	Current Response time	1 ms or better
8	Max. Cycles	60000 or higher
9	Max. steps in each cycle	250 or higher

10	Program End condition	Voltage, Current, Δt, Capacity
11	Protection	Top Voltage Limit, Lower Voltage Limit, Top Current Limit, Lower Current Limit
12	Logging Frequency	10 Hz (10 pts/s) or better
13	Software	Data acquisition and data analysis software with lifetime free updates. Automatic data backup during power failure. The date should be exported into Excel, Origin, and so on. Should be Interfaced with computer The program should be extended to a minimum of 64 channels
14	Interface Cable/Electrode Leads	Should provide the interface cable, coin-cell clips, and cell clips for each channel
15	Accessories	4-Electrode Alligator Clip -10 Nos. Coin Cell Clip with Fixer -10 Nos. Pouch Cell Clip -10 Nos.
16	Power	AC 230V/ 50 Hz
17	Personal Computer (PC)	02 Nos - A Personal Computer with the latest configuration: i7 processor 10th generation, 16GB RAM, DVD - RW, 500 GB SSD, Windows 11 with lifetime license, latest Microsoft Office professional, 27” LCD display, Wifi enabled or with better specifications.
		All software shall be loaded into the hard disk with appropriate partitions. All original CDs/DVDs must be provided
		02 No of UPS (5 KVA) for 1 hour or higher power backup should be included for continuous running of cycling test (2 years warranty on UPS and 2 years warranty on batteries)
Terms & Conditions		
1	Terms & Conditions	Manufacture/Supplier should have sizable installations of the same or better model worldwide and at least five in India which includes Education/Research Institutions, Testing, and Centrally funded institutions.
		A Satisfactory Performance certificate from at least one Customer is to be provided for eligibility. Bidder should submit complete contact details

		Service Support: Reporting time within two working days after the official request for service
		Hard copies of operational & service manual - 01 set
2	Scope of supply	A complete list of items quoted are to be provided
3	Warranty	Minimum 2 years warranty must be provided
4	Training	Onsite Training on the operation & maintenance of the equipment should be provided Complete training on Fabrication of Pouch cell energy storage devices.
5	Installation & Commissioning	The Machine should come with all other essential accessories & spares necessary for installation, commissioning & operation

7. BET Surface Area Analyzer		
Sl. No.	**Specification**	**Range / Value**
1	Applications:	Should capable of analyzing Surface area of solid and porous materials such as polymer materials, fibers, medicine/ pharmaceuticals, pigments, carbon black, ceramics, battery materials, cosmetics, cement, Toner particles, separation membrane, semi-conductor, adsorbent, nanomaterials, etc.
2	Analyses:	Single- and Multipoint BET (Brunauer, Emmett, and Teller) surface area, thickness, pore area distributions (BJH method), pore volume, and pore surface area Langmuir surface area, Temkin and Freundlich isotherm analyses
3	Measurement type	1. Surface area: BET, Langmuir, t-plot, BJH/DH, DR, DFT
		2. Mesopore size: NLDFT, BJH/DH
		3. Micropore Size: NLDFT, QSDFT, SF, HK, MP method, DA, Monte Carlo
		4. Pore Volume: Gurvich, α-s, BJH/DH, DFT, DR
		5. Adsorption energy: DR
		6. Fractals: FHH/ NK
4	Analysis gases:	· Nitrogen (N_2), CO_2, He
		· System should compatible with other gases like Ar, H_2, O_2, CH_4 or other non-corrosive gases
5	Measurement Principle	Volumetric (Constant volume gas adsorption method)
6	Surface area range:	0.01 m^2/g and above
7	Pore size distribution:	0.35 to 500 nm
8	Pore volume:	2×10^{-6} cc/g (liquid), 1×10^{-4} cc/g (STP) or lower and micropore volume accurately detectable within 0.0001 cc/g or similar provision should be available
9	Transducers	133 kPa (1000 mmHg); ± 0.25% of full scale or better
		1.33 kPa (10 mmHg); ± 0.5% of reading or better
		0.133 kPa or better (1 mm Hg) or better

10	Sensitivity:	1. less than 2 x 10^{-8} moles adsorbed/desorbed gas with 01 torr transducer.
		2. Should have technology for high sensitivity
11	Maximum P/Po using nitrogen:	Up to 0.999
12	Ultimate vacuum:	$5x10^{-9}$ mbar or better
13	Degassing:	1. The system should have smart degassing to monitor pressure and pause heating and able to automatically terminate heating according to programmable test. Should have refillable cold trap or similar provision.
14	Pressure	Pressure Measurement Resolution at each micropore analysis port: 0 to 0.1 mm Hg Transducer: 0.0000001 mm Hg 0 to 10 mm Hg Transducer:0.00001 mmHg 0 to 1000 mmHg Transducer: 0.001 mmHg or similar provision should be available to maintain precise saturated pressure
15	Pressure gauge	A suitable gauge is to be provided to measure the specified range.
16	Heating mantles	Temperature should go upto 350 °C and suitable thermocouples for over-temperature safety.
17	Dewar vessel	The Dewar vessel should have enough capacity to extend uninterrupted analysis period over 50 hours without refill.
18	Gas cylinder:	N_2, CO_2 and He Cylinder with two-stage regulators for individual gas type should be provided. It should be of 99.999% pure
Accessories to be quoted and supplied along with machine / equipment:		
19	Reference materials	Certified reference standards (Suitable standards for micropore & mesopore range) to be supplied for while making adsorption studies.
20	Sample cell:	Total 10 sample cells and 10 sample cell rod to be supplied.
21	Other Consumables	Additional Consumables like O-Rings, suitable filler glass rod, etc for 3 years.
22	Transducer	Additional set of all transducers: one each

23	CO2 Accessories	Recirculating dewar and chiller for temperature range: -10 to 70 degree C
24	RoHS 3 Compliant	The instrument should comply to RoHS 3 Compliant
25	Computer system and software	1. High-end with state-of-the-art hardware: Processor 1.8 GHz Intel core i7, 8 GB RAM, 1 TB hard Drive, CD ROM, network card, USB ports, keyboard, mouse, Microsoft Windows 10 (64 bit), 27 inch Monitor and laser printer
		2. UPS (5 KVA) for 1 hour or higher power backup (3 years warranty on UPS and 3 years warranty on batteries).
		3. Licenses for all the desired software (including NLDFT and QSDFT for accurate micropore size) for both data collection and analysis should be available.
	Non-technical parameters	
26	Warranty	3 years warranty should be provided with continued software upgradation from the date of installation.
		The duly authorized representative(s)/scientists of the CIPET shall have the right, before payment, to inspect the Goods either at the OEM stores/during manufacture, or at the Place(s) of Delivery. The Supplier shall provide all facilities for such inspection.
		Any inspection carried out by representative(s) of the CIPET or any waiver thereof shall be without prejudice to other provisions of the Contract concerning obligations assumed by the Supplier, including specifications of the Goods.

27	Inspection and acceptance	Upon delivery and inspection of the Goods, the CIPET shall inspect the goods as soon as possible and complete the Goods Receiving Document. Should any Goods fail to conform to the technical specifications, codes and standards under the Contract, the CIPET may reject the Goods. The supplier shall, at no cost to the CIPET, replace the rejected Goods or, alternatively, rectify the non-conformity.
		In the case of Goods ordered on the basis of specifications or samples, the CIPET shall have the right to reject the Goods or any part thereof and terminate the Contract if the Goods do not conform to the specifications and/or samples. Nothing in this clause shall in any way release the Supplier from any warranty or other obligations under the Contract.
28	Training and Installation	1. The equipment should be installed by certified engineer of the firm
		2. Supplier responsible for installation and training for at least three days or as per the requirement at site.
		3.The vendor should have a proper application laboratory in India to assist us in method development, sample analysis, training, and on our applications.
		4. A complete set of manuals for the operation of equipment should be given.
29	Documentation:	CE marking confirmation, Installation documentation, operation and maintenance Manuals on CD, and OEM manuals should be provided with the system

8. Polarographic analyzer		
Sl. No.	**Specification**	**Range / Value**
1	Application	To meet as per IS 15030 requirement for the determination of carboxybenzaldehyde by pulse polarographic analyzer.
2	Other Requirements	Polarographic analyzer fitted with dropping mercury electrode and computer controlled system
3	Application	For analysis of various Ions in Water and a variety of aqueous and non aqueous solutions used in : Pharmaceuticals Bio Chemical Food Beverage Metallurgical Pollution Control Battery & Other Industries Pesticide testing Labs

4	**Counter electrode**	
	· Voltage output	±12V max
	· Current output	±12, 5mA max
	· Slew rate	1MV/s to 10V/s or similar
	· protection	Thermal, overload and short-circuit
5	**Working electrode**	
	· current measure	From 1nA to 10mA full scale in different ranges
	· current resolution	From 1pA at 1Na Full scale to 1µA at 10 mA full scale or equivalent
	· measuring accuracy	±0,2% (conversion at full scale)
6	**Reference electrodes**	
	· input impedance	>1TΩ
	· input capacitance	<20Pf (1m cable)
	· biasing current	<2pA at 25˚C
	· common mode rejection	>50dB full frequency response
	· voltage range	±10V max
	Polarization capability	
	· voltage	±4V max
	· current	±10mA max

7	· voltage resolution	1mV or
	· current resolution	1pA
	· accuracy	±0,2% (conversion at full scale)
8	**Response time**	
	· potentiostatic rise time	10µs resistive load (1000Ω) or similar
	· galvanostatic rise time	25µs resistive load (1000Ω) or similar
9	**Digital interface**	
	· Connection	USB with full instrument control
	· Memory	
10	**Cell connection electrodes**	
	· Working electrode	Dropping mercury electrode (Drop Size- Large)
	· Counter electrode	Mode: DME/HMDE (Out of SMDE, DME, HMDE)
	· Reference electrode	Ag/AgCl (saturated KCL electrolyte) Magnetic (computer controlled)
11	Other requirements	Chemicals: 1.AR Potassium hydroxide PEG 6000 GR grade Carboxy Benzaldehyde : AR Grade Purity – 99% 2.Computer: 23.8'' Full HD IPS Display, Intel Core i5 12th Gen, Windows 11 Home Desktop with license, (8GB, 1TB HDD, 256GB SSD, Intel) 3. Printer: Laser Jet A4 Monochrome All-in-One Printer with Networking

12	Additional Terms and Conditions	Warranty- 02 years
		Vendor should provide installation details of at least 05 nos. of similar equipment
		A complete set of manuals for installation and operation should be provided

9. Limiting Oxygen Index (LOI) Tester		
Sl. No.	**Specification**	**Range / Value**
1	Make / Model	Bidder to specify
2	Purpose	**To measure the minimum concentration of oxygen that will support combustion of Polymers, Rubbers, Fibers, Films, FRP products, Composites & allied Products**
3	Applicable standard	ASTM D2863, ISO 4589-2
4	Digital Read out for oxygen concentration **Resolution**	±0.1% or equiv.
5	Test Chimmney	Made of heat resistant glass tube of inside diameter of 75 – 100 mm, and 400 – 500 mm height.
		The bottom of the chimney or the base to which the tube is attached shall contain non-combustible material to mix and distribute evenly the gas mixture entering at this base. Glass beads of size 3 to5 mm in diameter in a bed 80 to 100 mm deep have been found suitable. The chimney shall be mounted securely on the base to prevent air leak.
		A lid of 40 mm diameter to the glass tube at the level at least 10 mm above the top of the cylindrical chimney.
		A gauze / wire screen making partition between combustible medium and tube to catch the falling fragments and keep the column clean.
6	Specimen holder	Small holding device that supports the specimen at its base and hold it vertically in the center of the chimney to be provided (For self-supporting specimen). Specimen holding device should hold injection moulded specimen,film samples,composites as per the recommended sizes.
		For samples which are flexible the specimen shall be supported by both vertical edges in aflame with reference marks at 20 and 100 mm below the top of the frame. The profile of the holder and its support shall be smooth to minimize induction of turbulence in the rising flow of gas.

7	Gas measuring and controlling devices	Capable of controlling the gas velocity through the chimney is 40±2 mm/s Calibrated pressure regulators and pressure gauges to be provided on the individual gas supply lines Needle valves and calibrated flow meters to be provided individually for each gas lines
8	Timer	capable of measuring time with an accuracy of ± 0.5 s.
		Maximum: 600 sec. Digital display to be provided
9	Flame Ignitor	Suitable flame ignitor having adjustable LPG fuel supply to be provided
10	Features	Paramagnetic Oxygen sensor for assessing accurate oxygen (< 0.1%) levels
		digital display, user-friendly operation
		Adjustable flow control needle valve (swagelok/SMC/Rosamount etc.) the flow of oxygen and nitrogen, improving the mixing accuracy
		Display: flow rate, elapsed time
		Uniform combustion atmosphere
		Dual inlet gas pressure gauges, 0-100 psi
		Ignition wand with variable gas control valve
11	Additional Requirements	Transparent radiant heated test column
		All necessary control valves,and filters shall be built in and the instrument making it easy to use
		Suitable for Testing of Polymers, Rubbers, Fibers, Films, FRP products, Composites & allied Products
12	Other Mandatory Items	Required filled gas Cylinders (Nitrogen & Oxygen) of capacity 47 L along with IS certified regulator, Screw type rench and safety guard alng with two air filter regulator of reputed make to be provided
		Machine should come with all other essential accessories & spares required for indipendent installation, commissioning & operation. Bidder should specify and quote for any other accessories required / available for better usage of machine.
13	Scope of Supply / Bill of Material	Bidder should submit Scope of Supply / Bill of Material with make model of each items.
		Hard copies of operational & service manual - 01 set
14	**Warranty**	Minimum two years from date of installation