

Technical Specification for Tender no.2021-22/07

2021 - 22 / 07 / 01 - Battery Sealing Machine (For Battery Pouch cell)

Sl. No	Item	Unit	Specication
1	APPLICATION		<ul style="list-style-type: none"> It is used to prepare the pouch type supercapacitor, batteries
2	Configuration		<ul style="list-style-type: none"> Glovebox compatible and can be placed through ante chamber
			<ul style="list-style-type: none"> The sealing machine and control unit separated one
3	Features		<ul style="list-style-type: none"> Sealing Mode: Top, side and vacuum
			<ul style="list-style-type: none"> Sealing blades should be made of Soft Rubber
			<ul style="list-style-type: none"> Manual Footswitch for sealing process
			<ul style="list-style-type: none"> It should operate both Vacuum Sealing Mode and Vacuum Standing Mode
4	Vacuum Sealing Dimensions		Minimum 200 x 150 mm or more
5	Edge Sealing Width		5 mm or better
6	Sealing blade		Soft type- may be rubber or similar material
7	Sealing Temperature		50-250 °C or better
8	Heating Timer		Adjustable from 0 - 99 seconds or higher
9	Vacuum Pump		<ul style="list-style-type: none"> Double Stage Rotary Vane Vacuum Pump Vacuum level – 10^{-3} torr or better
			<ul style="list-style-type: none"> Vacuum fitting: Built-in KF25D standard Inlet/outlet port compatible to integrate with glove box
			<ul style="list-style-type: none"> Provide the suitable vacuum pump and related accessories (high-quality vacuum oil- 5L, Exhaust filter)
10	Sealing Pressure		<ul style="list-style-type: none"> Adjustable pressure - $0 \sim 7 \text{Kg/cm}^2$
			<ul style="list-style-type: none"> Glove box compatible pressure driven gas system
			<ul style="list-style-type: none"> Supply necessary accessories and fittings
			<ul style="list-style-type: none"> Provide the necessary air compressor for outside sealing purpose
11	Glove Box Compatibility		<ul style="list-style-type: none"> KF40 Feedthrough with all necessary wires and tubes
			<ul style="list-style-type: none"> Inert gas – high purity Ar/N2 cylinder
12	Power		230 -240 V, Single phase, 50/60 Hz
13	Accessories		Required accessories should be quoted
Note:	General terms and conditions		
	<ul style="list-style-type: none"> Tenders should specify and quote the necessary accessories required for installation and running the machine. 		
	<ul style="list-style-type: none"> Minimum 2 years compliancy warranty to keep the equipment in continuous working condition. 		

<ul style="list-style-type: none"> ▪ Onsite training as well as application support should be provided by the vendor at its own cost.
<ul style="list-style-type: none"> ▪ Necessary spares and Consumable for 2 years
<ul style="list-style-type: none"> ▪ Appropriate tool box/kit for routine maintenance should be provided with the equipment
<ul style="list-style-type: none"> ▪ Technical support and service: Availability of technical support in the area of application and service both within the country, The Tenderer shall have local service and application office and infrastructure to attend by visit within 48 hours of need.
<ul style="list-style-type: none"> ▪ All documents (i.e. manuals, drawings etc.) and original software's relevant to the instrument and its accessories must be supplied.

2021 - 22 / 07 / 02 - Clean Room Facilities			
Sl. No	Item	Unit	Specication
1	Application		<ul style="list-style-type: none"> • RCA Process., Piranha Process. • Development process. • Lift off and metal etch process. • HF dip for native oxide removal. • Wet etch. • Glass/PET substrate cleaning.
2	Description		The size of clean room is 581 sq. ft. and 80% of it is maintained as per class 1000 (ISO 6) and the rest is class 100 (ISO 5). Complete class 100 area covered with yellow light and dedicated for Lithography process.
3	List of chemicals allowed		Acetone, IPA, NH4OH, HCL, HF, H ₂ O ₂ , H ₂ O, BHF, TMAH, HNA, Resists, developers and strippers.
4	Substrates allowed		Si, Quartz, GaAs, Ge, Al ₂ O ₂ , SiC and other substrates on request.
5	Fume hood & Clean Bench		<p>Suitable fume hood for device fabrication.</p> <ul style="list-style-type: none"> • Hood should have constructed from all white stress-relieved, acid resistant, non-corrosive polypropylene or better. • Working dimensions (WxDxH)mm: 1500*900*1700 • Microprocessor based controls: A microprocessor controller monitors face velocity and displays the real-time airflow on the LCD screen in linear feet per minute. • Easy-access utilities panel for operation and maintenance. • Should have sink, electrical outlets, digital airflow alarms, gas, water, air facilities and base cabinetry. • Corrosion resistant interiors and exteriors.

		<ul style="list-style-type: none"> Noise and Sound Levels < 60db
		<ul style="list-style-type: none"> Filter Assembly: Large Separator-Less HEPA Filters, 99.99% Efficient on 0.3 Micron Particle
		<ul style="list-style-type: none"> Air Velocity: Down Flow Velocity: 60 LFPM (0.30 m/s) Inflow Velocity: 105 LFPM (0.53 m/s)
		<ul style="list-style-type: none"> Suitable light for clean room
6	Technical specifications	<p>Ø Working area dimensions: 2000mm X1000 mm X900 mm and closing slash.</p> <p>Ø Laminar flow dynamics with FFU and HEPA filers 99.99%.</p> <p>Ø Room Humidity is maintained 50% +/- 2 and Temperature around 20 +/- 2.</p> <p>Ø General exhaust is available to remove fumes during process.</p>
7	Gas Facilities	<p>Gas Facilities in the clean room bench:</p> <p>Gas Cylinders with Refill & Regulators</p> <ul style="list-style-type: none"> Ultra High Pure, Brand New High Pressure Seamless Steel Cylinder, ISI Marked, Confirming IS 7285 specification, Flat / Concave Bottom fitted with Valve as per IS: 3224-1988 complete with neck ring & cap, painted as specified under Gas Cylinder Rules 2004 Supported with following documents: ISI Marking / Quality Certificate, Hydraulic Test Certificate, Approval Certificate from Chief Control of Explosives, Govt. of India <p>Gas Cylinders with Refill: Argon-01, Oxygen-01 and Nitrogen-01</p> <ul style="list-style-type: none"> Ultra High Pure; Cylinder Capacity: 47 ltrs; Cylinder Type : Carbon Steel; Purity: 99.999% (5.0 Grade); Pressure : 130 – 140 Kg/cm²; Gas Volume : Approx. 7.0 Cu.m per Cylinder Impurities in : O₂ < 2, H₂O < 2, CO+CO₂ < 0.2; PPM :THC < 0.2; Stability : 12 Months. <p>Gas Regulators: Argon-01, Oxygen-01 and Nitrogen-01</p> <p>Resistance Pressure:</p> <ul style="list-style-type: none"> It is compatible with valve as per IS: 3224-2002 Regulator with Input and Output gauge suitable for Argon, H₂, N₂, O₂, Gas <p>Specifications:</p> <ul style="list-style-type: none"> Stainless Steel Specially cleaned Body Leaking Rate: <1 x 10⁻⁶ Mbar Seals: Teflon Diaphragm: Stainless Steel SS

		<ul style="list-style-type: none"> • Inlet Pressure: 0 – 140 Kg/Cm² • Outlet Pressure: 0 – 16 Kg/Cm²
		<p>Accessories:</p> <p>Cylinder opener : 02 Nos; Gas tube (Polyurethane): 8 mm dia. -50 mtr, 10 mm dia. -50 mtr, Pneumatic Connectors: 8mm to 6 mm – 5 Nos; 10mm to 8 mm - 5 Nos; 8mm to 8 mm -5 Nos; 10mm to 10mm - 5 Nos.</p>
8	TERMS & CONDITIONS	1. Tenders should specify and quote all mandatory and other accessories required for installation, commissioning and running the machine.
		2. The vendor should supply PCs with requisite specifications and data transfer accessories compatible with the equipment.
		3. All necessary CRM along with the calibration certificates wherever required traceable to international standard should be provided.
9	AMC	AMC charges for additional 3 years should be quoted additionally.
10	PRE-REQUISITES	1. Pre-installation requirements indicating details of power requirement, utility air, water, ventilation, safety device, if any, along with the foundation requirement needed for installation & commissioning should be provided with tender document.
		2. The vendor should have technical support in the area of application and service available within the country.
		3. The power requirement of UPS for providing a back-up of minimum 01 hour should be specified.
11	SERVICE	1. Appropriate tool box/kit for routine maintenance should be provided with the equipment
		2. All documents (i.e. operating & service manuals, drawings etc.) and original softwares relevant to the instrument and its accessories must be supplied.
		3. In case of any up gradation of software within the period of warranty then the same should be provided free of cost by the supplier/manufacturer.

		4. Power and receptacle/socket as per Indian Standards should be provided.
		5. The vendor shall have local service and application office and infrastructure to attend by visit within 48 hours of need.
12	VENDOR TRACK RECORD	6. The vendor should furnish details of customers in India.
13	TRAINING	Onsite training for system operation and maintenance as well as application support should be provided by the vendor at its own cost.

2021 - 22 / 07 / 03 - Computerised Universal Testing Machine Model 100 KN

Sl. No	Item	Unit	Specication
1	Application		To be designed for testing of Metal (ferrous, non - ferrous), Plastics & allied products under Tension, flexural and compression bending
2	Maximum Capacity	100 KN	
3	Measuring Range	0-100 KN	
4	Load Resolution	(+/-) 0.5% of full scale	
5	Resolution of Piston Movement	0.1mm	
6	Clearance For Tensile at fully descended working Piston	50-800 mm	
7	Clearance for compression test at fully descended working Piston	0-800 mm	
8	Clearance between columns	Should be more than 600 mm	
9	Ram Stroke	250 mm or equivalent	
10	Straining / Piston speed (at no Load)	0-100 mm/min.	
11	Load capacity	1 KN,5 KN, 20 KN, 50 KN, 100KN with LC-0.0001N	
12	Load cell Accuracy		± 0.5% of reading down to 1/50 of full scale with ASTM E83 class B extensometers should meet or better
13	Standard Accessories		
14	1) <u>TENSILE TEST FOR METAL PIPES - SPECIMEN :-</u>	0-25 mm	Grip head arrangements for the tensile Specimen of metal pipes with throat area available with Shank length of different diameters :- (Tensile Test Method IS 1608 / ISO 6892)
15	2) <u>TENSILE TEST FOR ROUND SPECIMEN :-</u>	10-25, 25-45, 45-70 mm	Clamping Jaw for Round Specimen of Diameter :-
16	3) <u>TENSILE TEST FOR FLAT SPECIMEN :-</u>	0-22, 22-44, 44-65mm, width Max. 70mm	Clamping Jaws for Flat specimen of thickness :-
17	3) <u>COMPRESSION TEST:</u>	350 x 350 mm.	Pair of compression plates of diameters
18	4) <u>TRANSVERSE TEST:</u>		
	Table with adjustable rollers of width	160 mm,	
	Diameter of rollers	50 mm,	

	Maximum clearance between supports	800 mm,
	Radius of punch Tops	16 and 22 mm.
19	Flexural Test	3 point Bend fixture with span continuously variable from 10mm to 300mm or more and roller sizes of radius from 6 mm to 76 mm.
20	Grips & Fixtures for Plastic/Rubber sample testing	Pneumatic and Screw type
		Specimen Thickness-200 microns to 10 mm
		Specimen length: 2 cm to 20 cm
		Specimen width: Up to 2 cm
		Provision of special gripping for polymeric, film and rubbery materials, Wide variety of grips and fixtures
		Pneumatic grip 25 x 50 mm up to 5 KN or better
		Pneumatic grips for fiber Rigid plastics (self lock wrench grip, opening up to 12mm), plastic/composite rod (upto 12 mm dia) woven sacks (100 mm width), rubber, fibre/filament.
	Compression test kit	
	Fixtures for peel and shear as per ASTM D 3330 Test method A 180°	
	Flexural - three point bend jig fixture with 4mm and 10 mm dia for specimen support up to 10 KN and adjustable span 50-300 mm or equivalent	
	Fixtures such as Tensile grips, mechanical wedge grips, roller grips, pneumatic vice grips suitable for low temperature testing and can be accommodated into environmental chamber	
21	Other Requirements	Loading accuracy as high as $\pm 1\%$
		Straining at variable speed
		Printer & PC graphs enable study the behaviour of the material.
		Motor driven threaded columns for quick effortless adjustment of lower cross-head-to facilitate rapid fixing of test specimen.
		Digital display.
		RS 232 serial port to transfer data to computer for analysis/storage evaluation etc.
22	Strain Unit	<ul style="list-style-type: none"> Rotary encoder of minimum resolution 0.1 mm. Strain
		<ul style="list-style-type: none"> Tension test to be conducted by fixing test specimen between upper and lower cross head
		<ul style="list-style-type: none"> Compression, bending, transverse and shear test to be conducted between lower cross head and table
		<ul style="list-style-type: none"> Provision for rapid change the position of lower cross head by operating screwed column for easy fixing of specimen
		<ul style="list-style-type: none"> Power pack based pressure maximum 200 Kg/cm²

23	Hydraulic control system	<ul style="list-style-type: none"> Should maintain continuous non pulsating oil flow for maintaining very smooth load application
		<ul style="list-style-type: none"> To maintain practically constant rate of piston movement
		<ul style="list-style-type: none"> Operation through pressure transducer
		<ul style="list-style-type: none"> Both load and displacement to be displayed on the digital readout simultaneously
24	Extensometer (Mechanical - Contact Type)	
24.1	Measuring range	Up to break
24.2	Least count	0.01 mm
24.3	Arm travel	800 mm
24.4	Thickness or diameter of specimen	1 to 20 mm
24.5	Calibration	Extensometers shall be calibrated, certified as per ASTM standards.
25	Data Acquisition & Software	Material testing Software with Metal & Plastic Module
		<ul style="list-style-type: none"> Real-time image, stress-strain curve, load deformation, load-time curve, load/strain, Young Modules etc. shall be displayed by the software.
		<ul style="list-style-type: none"> The upper and lower yield, maximum breaking and strain, breaking/elongation ratio of selecting point etc. required be supplied from graphic.
		<ul style="list-style-type: none"> Software shall record and generate test report. The software shall have wide range of process. Test results can be displayed in Metric and System International (SI) system.
		<ul style="list-style-type: none"> Automatic zeroing at the beginning of the test and auto return facility after specimen failure is required
		<ul style="list-style-type: none"> All test results to be displayed on the screen. System should have option for automatic break detection
		<ul style="list-style-type: none"> Software should compatible with extensometer
26	Accessories	The manufacturer shall recommend along with the price, list of the spare parts sufficient for a period of two years trouble-free operation of complete system. Computer system & Printer to be provided.
		<ul style="list-style-type: none"> The Supplier shall be responsible for carrying out the Installation and Commissioning at customer site.

27	Installation, Commissioning & Performance guarantee	<ul style="list-style-type: none"> ● Shall provide guarantee for the satisfactory performance of the system for a period of two year after satisfactory installation and commissioning at Purchaser's site. ● Complete training should be provided at the site.
28	Technical support and service	Manufacturer should have established after sales & service network in India. The vendor shall have local service and application office and infrastructure to attend by visit within 48 hours of need. AMC for 3years after warranty period.
29	Fixture	Fixture for Monofilament & Rope

2021 - 22 / 07 / 04 - Computerized Universal Testing Machine (100 KN) with Electronic Extensometer and all Accessories			
Sl. No	Item	Unit	Specication
1	Control System		<ul style="list-style-type: none"> ●Should be equipped with one closed loop servo controllers ●It should have Closed loop servo control with PID compensation. Shall include monotonic, cyclic, and segmented control profiles with software selectable control channels, that can be changed quickly at any instance ● Servo Loop Update rate of 8kHz or better ● It should have data log rate of 1kHz or better ● Data Resolution of 1/10,00,000 or better ● Resolution of 24-bitdata with data sampling frequency of 200kHz or better ●High Speed Data Collection Rates of 5000 points/sec or better ●Provision for Self-Identification of, Load Cells and Extensometers ● Accept six Input channels for Load, Position, Axial Strain, Transverse Strain and strain ports. (Proof of this facility shall be submitted) ● It should have 3 Default control modes: Position Control, Load Control and Strain Control (Proof of this facility shall be submitted) ● It should have provision to stop / return the cross head automatically at the end of test ●Electronic Safety Limits feature for protection of sensors like Load Cell, Extensometer etc ● Standard non-restrictive USB 2.0 communications between the electronics and the computer. No Ethernet ports are acceptable. ● It should have Facility to add any accessories in future without any modifications ● It should perform all common mechanical tests in tension, compression, shear and flexure as per ASTM, DIN, ISO and JIS standards ●Proof of facility along with catalogue to be uploaded
2	Maximum Load Capacity	100 KN	

3	Load Frame	<ul style="list-style-type: none"> ● Load Capacity should be $\pm 100\text{kN}$ Static rating ● The machine should have robust dual column construction, vertically oriented, with easy access for the job mounting and dismantling, grips changing, extensometer positioning etc. ● It should have very high precision, backlash free ball screw technology for accurate position control ● It should have Ball Screw Driven, Hardened and Hard Chrome Plated Dual Column Precision Aligned Load Frame ● The machine should be Floor Standing without any requirement for foundation/grouting ● It should have Superior Axial Stiffness of 300kN/mm or higher <ul style="list-style-type: none"> ● The frame shall include dual level limit switches on the front of the frame to prevent cross head from over travelling ● Jog Speed: It should give provision to user to specify the jog speed to protect samples of light materials while mounting ● Speed selection must be available for return to home position after test completed ● Return speed shall be 500 mm/min or better ● There should be provision for crosshead movement through jog panel as well as through software ● Capable to perform tests in high / Low temperature for tensile and compression applications in the range -70°C to 200°C ● Should be Operable on Single Phase 220 VAC, $50/60\text{ Hz}$ ● Proof of facility along with catalogue to be uploaded
4	Testing speed & Position Control	<ul style="list-style-type: none"> ● Maximum Testing Speed shall be $\geq 500\text{mm/min}$ ● Minimum Testing Speed shall be $\leq 0.00005\text{ mm/min}$ ● Maximum Force at full speed: 100kN ● Position control resolution shall be 0.00005mm or better ● Over all class of the UTM shall be 0.5 as per IS1828-part 1/ ISO 7500-part 1 ● Position measurement resolution: $0.02\mu\text{m}$ or better ● Speed Accuracy: 0.1% of set speed or better ● Total Crosshead travel should be $1,000\text{mm}$ or more ● Total Vertical Test Space should be $1,100\text{mm}$ or more ● Space between columns should be 550mm or more ● Proof of facility along with catalogue to be uploaded

5	100kN Tension/Compression Load Cell	<ul style="list-style-type: none"> ● Tension/Compression Static Load Cell: $\pm 100\text{KN}$ Load Cell in Tension/Compression with self-identification ● Digital auto calibration should be supplied with an accuracy of $\pm 0.5\%$ ● Load Measurement Accuracy should be $\pm 0.5\%$ of reading values down to 1/500 of load cell capacity <p>Accuracy (Max Error):</p> <ol style="list-style-type: none"> 1. Static Error Band% FS ± 0.05 or equiv. 2. Nonlinearity% FS ± 0.05 or equiv. 3. Hysteresis% FS ± 0.06 or equiv. 4. Non-repeatability% RO ± 0.01 or equiv. 5. Creep, in 20 min% ± 0.025 or equiv. 6. Side Load Sensitivity% ± 0.25 or equiv. 7. Eccentric Load Sensitivity%/in ± 0.25 or equiv. <ul style="list-style-type: none"> ● It shall conform the following standards for accuracy: ASTM E4, BS 1610, DIN 51221, ISO 7500-1, EN 10002-2 ● It should withstand the forces up to 150% of their indicated values ● Proof of facility along with catalogue to be uploaded
6	1kN and 100 N Tension/Compression Load Cell	<ul style="list-style-type: none"> ● Tension/Compression Static Load Cell: $\pm 1\text{KN}$ and 100 N Load Cell in Tension/Compression with self-identification and digital autocalibration should be supplied with an accuracy of $\pm 0.5\%$ ● Capacity: 1kN AND 100 N ● Load Measurement Accuracy should be $\pm 0.5\%$ of reading values down to 1/500 of load cell capacity <p>Accuracy (Max Error):</p> <ol style="list-style-type: none"> 1. Nonlinearity% FS ± 0.03 or equiv. 2. Hysteresis% FS ± 0.02 or equiv. 3. Non-repeatability% RO ± 0.01 or equiv. 4. Creep, in 20 min% ± 0.025 or equiv. <ul style="list-style-type: none"> □ It shall conform the following standards for accuracy: ASTM E4, BS 1610, DIN 51221, ISO 7500-1, EN 10002-2 ● Proof of facility along with catalogue to be uploaded
7	Adaptor	Adaptor Packages should be provided for ex-changing 100 kN and 1 kN and 100 N load cells

<p>8</p>	<p>Grips and Fixtures</p>	<ul style="list-style-type: none"> ● Capacity: 100kN ● Max. sample width: 50mm, Max gripping length: 50mm Max gripping length: 50mm ● Pyramid Jaw faces for flat specimens from 0.1 to 30mm thick ● V-jaws for round samples from dia Ø 5mm to 30mm ● Jaws should be 67(H) mm X 100(W) mm or more ● Material of construction: Steel or equiv. ● Suitable for tensile testing of composites, metals and hard plastics. ● Foot pedals: The jaws of the grip open by pressing the foot pedal and remain opened after removing the foot from the pedal. The jaws close by pressing the pedal one more time. It shall include 1 pair of foot switches including tubes and fittings ● Hand Operated Switches: With locking function: The jaws of the grip close by pulling the lever switch and remain closed. The jaws open by pushing the handle lever switch back. It shall include 1 unit of hand switches including tubes and fittings ● Proof of facility along with catalogue to be uploaded
<p>9</p>	<p>Pneumatic Grip</p>	<ul style="list-style-type: none"> ● As per ASTM D 412 ● Opening of the clamping jaws: 0-9mm ● Max. Sample Width: 30mm ● Flat specimens from 0.1 to 9mm thick ● It should include rubber coated insert jaws, with clamping surface H x W: 30 x 30 mm or more ● Shall be suitable for general Tensile Testing of plastics, rubbers, polymers, metal strips, foils etc ● There should be carriers for quick changing of insert jaws for low running cost ● Foot pedals: The jaws of the grip open by pressing the foot pedal and remain opened after removing the foot from the pedal. The jaws close by pressing the pedal one more time. It shall include 1 pair of foot switches including tubes and fittings ● Hand Operated Switches: With locking function: The jaws of the grip close by pulling the lever switch and remain closed. The jaws open by pushing the lever switch back. It shall include 1 unit of hand switches including tubes and fittings Clamping force: 1kN ● Proof of facility along with catalogue to be uploaded
<p>10</p>	<p>Compression Platens:</p>	<ul style="list-style-type: none"> ● Capacity: 100kN ● Platens Diameter: 150mm or higher ● Material of construction: Steel ● Suitable for composites, metals etc. ● One Pair with Adapters ● Proof of facility along with catalogue to be uploaded

<p>11</p>	<p>Flexure Fixture, 3 Point & 4-point Bend Fixture</p>	<ul style="list-style-type: none"> ● Suitable for soft composites, metals etc. ● Capacity: 10kN or higher ● Minimum span: 30mm ● Maximum span: 300mm ● NoseLoading Nose roller diameter: 10mm ● Support roller diameter: 10mm ● As per ASTM D 790& ASTM C 1161 ● It should be provided with articulating bearing and exchangeable rollers ● Material/Finish: Steel ● Three supports of rollers: 10mm, 20mm and 30mm ● Ideal for uni-directional 3-point bend tests on rigid / semi rigid materials like metals, plastics and composites ●Proof of facility along with catalogue to be uploaded
<p>12</p>	<p>Roomtemperature Axial Extensometer</p>	<ul style="list-style-type: none"> ● Gauge Length: 25mm ●Extension: + 50%, -10% of Gauge Length or equiv. ● Linearity: 0.15% of full scale or equiv. ● Excitation: 5 to 10 VDC recommended, ● Output: 2 to 4 mV/V, nominal or equiv. ● Linearity: 0.10% to 0.15% of full-scale measuring range or equiv. ● It should fit for round samples dia 25mm and flat samples 12mm thickness and wide 30mm ● It should Include spring loaded quick attach kit and various knife edges for flat and round samples. ● Balanced design and low friction support ● Strain Measurement Accuracy: +/- 0.5% ofreading as per ASTM E83 class Bextensometers. ● It shall meet or exceed ASTM E83 and BS, EN, ISO9513: 2002 standards. ● For deformation measurement of polymer composites,plastics and metals ●Proof of facility along with catalogue to be uploaded

13	Environmental Chamber	<ul style="list-style-type: none"> ● Construction: Brushed Stainless Steel shell exterior and internal liner ● Internal Dimensions in mm: 220W x 220D x 580H or equiv. ● Usable Temperature Range: -70 degC to 120 degC or equiv. ● Accuracy: +/- 1deg C ● Temperature regulation to within 0.10 C or equiv. ● Power: 8.5 amps/2000watts @ 220V 50Hz ● Thermocouple: Type K, with connector and mounting bracket ● 4-layer glass View Port with integral heating elements ● Cooling Assembly: Includes LN2 injector assembly installed and solenoid valve for oven temperature down to -70 degC ● Slide Assembly to move the chamber out of test area when not in use ● Includes Load Train Port inserts ● Includes Dewar flask with flexible connecting pipes for connecting it to pressurized LN2 gas cylinder ● Anti-reflective glass to use with laser / Video extensometer ● Proof of facility along with catalogue to be uploaded
14	Mandatory spares	Please quote all controller PCBs, Motor Drive, Encoder, any interface PCBs, relays etc for 5 years smooth running of machine.
15	Personal Computer System (Reputed make):	<ul style="list-style-type: none"> ● Intel i76th generation or higher processor with 3.5GHz or higher speed ● 1TB Hard Disk Drive ● 8GB RAM, 4GB Graphics card ● 23" LED Monitor ● DVD writer, Keyboard, Mouse ● Windows 10.0 Pro operating system and MS Office installed ● Laser Jet Printer with UPS
		<p>a. Configure a specific transducer (such as load cell or extensometer) and link it with a specific method</p> <hr/> <p>b. Software should have the capability to perform tear, adhesion, peel, cyclic tests in addition to tensile, flexural and compression tests</p> <hr/> <p>c. Window's based graphical user interface.</p> <hr/> <p>d. User calculation creator for defining custom calculations.</p> <hr/> <p>e. Automatic grip control (frame dependent).</p> <hr/> <p>f. Saving and retrieval of test methods and data. Advanced data management and high-speed data retrieval system for accessing history. Option to edit/change/modify history.</p> <hr/> <p>g. Software should automate data acquisition, machine control, analysis, and reporting for a wide range of test requirements.</p> <hr/> <p>h. The standard templates should include but not limited to monotonic loads, tests with varying rates of loads including linear, sine, cyclic, ramp, etc.</p>

16	Software	<p>i. The software should have the capability to save the test method along with the start position, limit positions etc. so that the machine automatically comes to the start position for testing when the file is opened.</p> <p>j. The software shall allow exporting the raw data into excel or word etc.</p> <p>k. Software must support data acquisition modes according to time, peak/valley, cyclic/ logarithmic.</p> <p>l. Machine must be able to measure & record following parameters, in SI units</p> <p>Ultimate Tensile Load (kN, N, kg)</p> <p>Breaking Load</p> <p>Yield Load</p> <p>Cross sectional area (mm² , cm² , m²)</p> <p>Ultimate Tensile Strength (MPa, N/cm², N/m²)</p> <p>Yield Stress</p> <p>Proof Stress</p> <p>Gauge Length (mm, cm, m)</p> <p>Elongation at specified load (%)</p> <p>Load at specified elongation or travel length</p> <p>Elongation (%)</p> <p>Modulus of Elasticity</p> <p>Must be able to plot/display real time online illustrative graph on display screen for :</p> <p>i. Load Vs Displacement</p> <p>ii. Load Vs Elongation</p> <p>iii. Stress Vs Strain</p> <p>iv. Stress Vs Elongation</p> <p>Software must be able to automatically calculate & report</p>
17	Essential Accessories	<p>I. All necessary fixtures/adaptors/accessories shall be supplied to set up and perform the flexure test using the UTM.</p> <p>II. To be provided along with 10KVA UPS for equipment</p>
18	Any other accessories required	Bidder should quote and supply any other accessories effective and better utilization of machine.
19	Calibration certificate	Calibration certificate for load cells and extensometer traceable to National / International Standards should be Provided
20	Scope of supply	Bidder should submit complete scope of supply (Machine, standard accessories, Optional Accessories etc with make model) in the technical bid with price. Bidder should supply complete start up package including material necessary to prove the machine and provide training.
		The bidder must have supplied machines at other Institutes in the past (a satisfactory performance certificate from those users may be solicited if needed). Bidder should submit complete contact details.

21	Terms & Conditions	Authorization Letter from OEM
		List of clients in last five years to be provided.
		Firms offering the product should have good track record of service support
		All manufacturers/supplier must submit the compliance statement along with the technical bid.
		Should provide catalogue of the equipment and proof of facility meeting with specification wherever desired. Offers must include sufficient technical documents in support of claims made in the comparative statements
		Manufacture/Supplier should have sizable installations of same model worldwide and at least five in India.
22	INSTALLATION, COMMISSIONING AND TRAINING	
23	Installation, Commissioning & Performance guarantee	<ul style="list-style-type: none"> The Supplier shall be responsible for carrying out the Installation and Commissioning at customer site.
		<ul style="list-style-type: none"> Shall provide guarantee for the satisfactory performance of the system for a period of THREE years after satisfactory installation and commissioning at Purchaser's site.
		<ul style="list-style-type: none"> Complete training should be provided at the site.
24	Technical support and service	Manufacturer should have established after sales & service network in India. The vendor shall have local service and application office and infrastructure to attend by visit within 48 hours of need.

2021 - 22 / 07 / 05 - Electric Field Measuring System (Hall effect measurement)			
Sl. No	Item	Unit	Specication
1	APPLICATION	:	"Hall effect measurement system with high and low temperature measurement facilities" The Hall Effect Measurement system will be used to characterize the semiconducting materials.
2	The instrument is aimed for measuring the type of charge carriers, carrier concentration and carrier mobility of semiconductors. The system should be able to accurately measure the Hall voltage, Hall coefficient, electrical resistivity, carrier concentration, carrier mobility, magneto resistance and alpha (ratio between the vertical and the horizontal resistance) values over a range of temperatures varying from 77K to 770 K or above.		
3	Any types of samples ranging from metals, elemental semiconductors, narrow and wide band gap semiconductors to doped-semiconductors, oxides, nitrides, sulphides, selenides and alloys in the form of both bulk and thin film must be measured using this instrument.		
4	The instrument should be able to identify the type of semiconductor (N/P type).		
5	The instrument should be able to accurately measure all types of samples size varying from 5 mm x 5 mm to 20 mm x 20 mm and thicknesses of 2 mm and above The system should be able to measure circular sample (diameter can vary from 10 mm to 20 mm) as well as square samples (8 to 20 mm).		

6	Thickness of the sample will be restricted to 2 to 3 mm. Separate sample holders must be provided for both circular and square samples (bulk and thin films) The sample holder must be non-reactive.	
7	The sample can be in 10^{-5} mbar (high) vacuum. The system should have provision for inert gas ambiance too.	
8	Magnet or Electromagnet will be capable of generating the magnetic field of 0.2 -1 Tesla or above. Magnetic field must be uniform throughout the sample and over an area of 36 cm ² .	
9	Type of magnet	Electromagnet / Static
10	Specification of magnet (Tesla)	0.2 to 1 Tesla and above
11	Power supply for magnet (voltage, frequency, etc)	All power supplies should be configured for 220-240 V/50Hz.
12	Temperature range	77K to 770K
13	Samples to measure	bulk and thin film samples (ceramics, bulk ,alloys , compounds, etc)
14	Sample size	5 mm– 20 mm, thickness 2 mm and above
15	Carrier density	$10^7 \sim 10^{21}$ cm ⁻³
16	Resistivity	$10^{-4} \sim 10^7$ ohm cm and above
17	Mobility	$1 \sim 10^7$ cm ² /Vs
18	Input current range	1 nA-20 mA
19	Output voltage	12V
20	Variable magnetic field	0.27~1T
21	Chiller, specification of chiller	2 L/min, 1 bar , minimum (if necessary)
22	Environmental control chamber	7 mTorr or better (if necessary)
23	Two standard samples must be provided along with the equipment.	
24	Magnet power supply will be included. Power supply should be bipolar and automatic. There will be provision for both AC and DC magnetic field.	
25	All type of power supply for all the needed part of the instrument must be included in the system Appropriate user interface software to acquire and plot the data.	
26	Complete system with all requisite hardware and software including desktop computer to analyse data (Branded PC i5, 8GB RAM, 1TB, HDD, 21 inch or more	
27	LED Monitor, Windows 10 OS, MS office Professional -2019).	
28	System must include furnace, electronics, Hall probe, vacuum chamber (if necessary), sample holder, sample mounting kit, additional two probe and four probes, gold electrodes (10 Nos), electromagnet and related parts.	
Note:	General terms and conditions	
	<ul style="list-style-type: none"> ▪ Tenders should specify and quote the necessary accessories required for installation and running the machine. ▪ Minimum 2 years compliancy warranty to keep the equipment in continuous working condition. ▪ Onsite training as well as application support should be provided by the vendor at its own cost. ▪ Necessary spares and Consumable for 2 years ▪ Appropriate tool box/kit for routine maintenance should be provided with the equipment ▪ Technical support and service: Availability of technical support in the area of application and service both within the country, The Tenderer shall have local service and application office and infrastructure to attend by visit within 48 hours of need. ▪ In case of any up gradation of software within the period of warranty then the same should be provided free of cost by the supplier/manufacturer. ▪ All documents (i.e. manuals, drawings etc.) and original software's relevant to the instrument and its accessories must be supplied. 	

- All necessary CRM along with the calibration certificates wherever required traceable to international standard should be provided.

2021 - 22 / 07 / 06 - Energy Dispersive X-ray Fluorescence (EDXRF) Spectrometer System

Sl. No	Item	Unit	Specication
1	Equipment details		<p>i. The instrument must be capable for the non-destructive qualitative and quantitative determination of elements in the periodic table from Carbon to Uranium in various liquid and solids, slurries, powders, alloys, and thin films samples.</p> <p>ii. The instrument must be capable of determining elements in the periodic table from Carbon to Uranium with the detection limit of < 3 mg/L or better in standard solution with suitable filter.</p>
2	Element Range		<p>iii. All elements in the range Mg (Z=12) to U(Z=92) present in the metallic/ceramic sample/component shall be analyzed and reported in the form of weight % and/or atom % on the display unit.</p> <p>iv. The list of detectable elements shall include Al, Mg, Si, P, S, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Zr, Nb, Mo, W, Ta, Re, Pb, Bi, Ag, Au, In, Ir, Cd, Sn, Se</p>
3	Concentration Range		From ppm to 100 %
4	Excitation Source/probe beam		<p>I. Rhodium (Rh)/ Tungsten(W) anode based X-ray tube (about 4 W) capable of operating up to 40 kV, suitable for analysis of low Z and high Z elements.</p> <p>II. Appropriate filters for detection of various elements with wide difference in atomic numbers.</p>
5	Primary Beam Filters		10-position automatic filter changer
6	Detector		High Resolution & large area Fast Silicon Drift Detector (Fast SDD) or suitable detector with capability to acquire X-ray data/count rate greater than 100 kcps (kilo counts per second).
7	Sample Chamber & Sampling System		<ul style="list-style-type: none"> • Computer Controlled rotating sample changer with provision for 10 samples. • Safety interlocks to prevent accidental radiation exposure. • Sampling system must be designed for the routine analysis of solids, liquids, slurries, powders, alloys, and thin films. • Leaded glass viewing window must be located above sample tray. • Sample chamber must contain vacuum valves, associated vacuum manifold, tubing, and hardware (including vacuum pump).
8	Sample Observation		<p>Integrated HD video camera</p> <ul style="list-style-type: none"> • Air mode • Vacuum mode
9	Atmosphere Mode		<ul style="list-style-type: none"> • Helium mode: • Helium mode with reduced pressure • Nitrogen mode

10	Software	<p>1. Built in calibration check at start including three standard specimens of Al alloy, Stainless steel and Zirconium alloy.</p> <p>2. Automatic grade identification using database of standard grade library (≥ 300 grades) covering various International standards including UNS and DIN.</p> <p>3. Standard grade library shall include low alloy steels, Stainless steels, Cr-Mo alloys, Tool steels and alloys of aluminium, copper, titanium, zirconium, niobium, cobalt, nickel etc.</p> <p>4. Report generation in English language with details of Specimen ID, date and time of analysis, grade of material, chemical composition and corresponding EDS spectrum.</p> <p>5. Automatic control of excitation and detection systems. Automatic sample handling and data collection/processing. Automatic data storage.</p>
		<p>6. Qualitative functions include: KLM, sum, and escape peak markers. Energy cursor with counts per channel display. Log, linear, uni-polar, and bi-polar display options. Automatic peak identification and labelling. Spectrum overlaps with scalable sum and difference manipulations. Digital filtration background suppression. Spectral matching routine. Synthetic spectra generation. Definable energy windows with net, gross, or counts per second readout and summary.</p> <p>7. The software must be able to determine quantitatively elements, oxides, soils, thin film and alloys within the accuracy of $\pm 1\%$ at 10 - 20% level of constituents.</p> <p>8. The supplier shall agree to provide technical support and free software upgrade/reinstallation of OS and application software in case of any software failure in the instrument for a period of 3 years from the date of supply.</p>
11	Sample Types	Loose powders, granules, solids, pressed pellets, fused beads, and liquids (Analyze all sample types)
12	Sample Rotation	Spin All samples
13	Connectivity	Built-in Ethernet port RJ45, 3x USB ports for mouse, keyboard, printer
14	Computer for data processing	<p>i. Branded PC, Intel I5 processor ,8 GB RAM and 500 GB hard disc or better, 16x DVD / Light scribe +/- RW drive or better, 25" TFT monitor, Gigabit LAN card, Ports:</p> <p>ii. Colour laser printer</p> <p>iii. UPS of 10 KVA to be supplied</p>
15	Acceptance criteria during installation	<p>i. The detection limit (DL) for Cr, Mn, Fe, Co, Ni, Cu, Zn, Ge, Hg and Pb with suitable filter for a period of 300 second must be provided separately</p> <p>ii. The analysis of SS-304 with the help of advanced fundamental parameters software must give the result of Fe and Ni with the error limit of $\pm 1\%$.</p>

2021 - 22 / 07 / 07 - Gas Permeability Analyzer			
Sl. No	Item	Unit	Specication
1	Testing standard	ASTM D1434, ISO 15105	
2	Testing range	0.02~50000 cm ³ / (m ² * 24h*0.1MPa)	

3	Temperature range	15~60
4	Temperature accuracy	±0.1
5	Humidity	15% - 90% RH
6	Vacuum degree	<20Pa
7	Vacuum resolution	0.01Pa
8	Gas supply pressure	0.2~0.8MPa
9	Test pressure	-0.1~+0.1MPa
10	Gas port	1/8 inch rubber tube
11	Test gas	O2, CO2, N2, etc
12	Test area	50.24 cm2
13	Sample Size	Φ110 mm or smaller
14	Sample thickness	≤2mm
15	Power supply	AC 220V, 50Hz
16	Other	Professional software with simple interface, easy to use and convenient to set test process.
		Fully-auto operation, judge and stop automatically.
		Vacuum-pumping process, air intake, testing, pressure maintain, constant temperature program automatic control, experimental status are displayed in real time.
		Curves display of transmission, water vapor concentration, temperature and humidity in real time. The curves with conceal function, support query function for background data.
		Display to observe temperature, humidity and transmission without external computer.
17	Calibration	Instrument support to two methods of reference materials and standard gas to certificate and calibrate;
18	Scope of Supply	Machine, standard accessories, work station with softwares and other items if any for smooth conduct of test as per requisite standard. Bidder should supply complete start up package including material necessary to prove the machine and provide training.
19	NIST traceable/NABL accredited calibration certificates to be supplied	

2021 - 22 / 07 / 08 - LINEAR MOTOR			
Sl. No	Item	Unit	Specification
1	SCOPE		To apply uniform mechanical force on polymeric samples under test, specifically the electrically modified structures.
2	Linear Motor		Linear Guides are compact guide units with integrated ball bearings, for operating linear motors with standard or heavy duty sliders.
			The load is mounted directly to the front plate of the linear guide. Mechanical dimensions and mounting options are compatible with pneumatic linear guides. The modular design allows simple addition of accessories, such as a mechanical brake or magnetic spring, for load balancing in vertical applications.
			<ul style="list-style-type: none"> • Mounting plate with counter bore for precise load mounting • Hardened or stainless steel shafts for precise positioning and quiet operation. • Ball bearings, for high load masses and long life

3	Linear motor construction	<ul style="list-style-type: none"> • Guide block with counter bores for uncomplicated, precise mounting of the Linear Module. 		
		<ul style="list-style-type: none"> • Mechanical end stop (rear). 		
		<ul style="list-style-type: none"> • Linear motor stator with integrated bearings, temperature and position sensors. 		
		<ul style="list-style-type: none"> • Clamping cylinder to secure the stator in the guide block. 		
		<ul style="list-style-type: none"> • T-slots in the guide block allow simple mounting of accessories. 		
		<ul style="list-style-type: none"> • Linear motor slider, guarantees maximum force and precise positioning. 		
		<ul style="list-style-type: none"> • Integrated linear coupling for simple mounting of the slider. 		
		<ul style="list-style-type: none"> • Cable and connectors <ul style="list-style-type: none"> • Pneumatic brake for linear guides • Fan for linear guide • Magnetic flange • Magnetic adapter 		
		4	Mechanical data	
		4.1	Stroke height	:
4.2	Slider length	:	500 mm or better	
4.3	Moving mass	:	2000 g or better	
4.4	Total weight	:	Should be less than 5000 g	
5	Servo Drive	:	Suitable Universal drive for linear motor	
		:	Motor supply: 72V / 25A or better	
		:	Programmable motion options	
			Should store motion commands	
			Suitable configuration interface with linear motor (Ethernet or RSS)	
			Works with all communication interfaces and controllers	
6	Optical table workstation	:	Optical table for fixing linear motor	
7	Table top	:	Active vibration isolation system	
8	Dimension	:	2500 x 1500 x 250 (LxWxH)	
9	Working surface	:	Stainless steel top plate	
10	Holes	:	Sealed with 25 mm depth	
11	Load capacity of legs	:	Isolated legs with maximum load capacity of 600 kg and a height adjustment of at least 25 mm	
12	Isolation	:	Horizontal isolation resonance ≤ 1.5 Hz	
		:	Vertical isolation resonance ≤ 1.0 Hz	
13	Compressor	:	Air compressor with suitable specification for optical table with less operating noise	

14	Software & manuals		Should be provided with suitable software for operation of linear motor with drive.
15	Computer	:	Branded PC i7, 8GB RAM, 1TB, HDD, 21 inch or more LED Monitor, Windows 10 OS, MS office Professional -2019
16	Accessories	:	Should be included required accessories in the quote. <ul style="list-style-type: none"> • Pneumatic brake for linear guides • Fan for linear guide • Magnetic flange • Magnetic adapter • Center Sleeve • Wiper for linear guides
Note:	General terms and conditions		
	<ul style="list-style-type: none"> ▪ Tenders should specify and quote the necessary accessories required for installation and running the machine. ▪ Minimum 2 years compliancy warranty to keep the equipment in continuous working condition. ▪ Onsite training as well as application support should be provided by the vendor at its own cost. ▪ Necessary spares and Consumable for 2 years ▪ Appropriate tool box/kit for routine maintenance should be provided with the equipment ▪ Technical support and service: Availability of technical support in the area of application and service both within the country, The Tenderer shall have local service and application office and infrastructure to attend by visit within 48 hours of need. ▪ In case of any up gradation of software within the period of warranty then the same should be provided free of cost by the supplier/manufacturer. ▪ All documents (i.e. manuals, drawings etc.) and original software's relevant to the instrument and its accessories must be supplied. 		

2021 - 22 / 07 / 09 - Planetary Ball Mill			
Sl. No	Item	Unit	Specication
1	Applications		Size reduction, Pulverizing, mixing, homogenizing, colloidal milling, mechanical alloying
2	Feed material type		Soft, hard, brittle, fibrous – dry or wet (organic and inorganic)
3	Grinding jar volumes from 12 ml to 500 ml	ml	12-500 ml or equivalent

4	Final fineness	Grinding to nanofinish up to 0.1 micrometer	
5	No. of grinding stations	02 number of grinding stations with working height	
6	Sun wheel speed	rpm	100 – 650 or equivalent digitally adjustable
7	Material of grinding tools	stain less steel	
8	Effective diameter	mm	More than 160
9	Setting of grinding time	Microprocessor control, digital setup in hours, minutes and seconds	
10	Interval operation	Interval operation with directional reversal and time setup	
11	Method storage	Min of 10 numbers	
12	Measurement of input energy	Option should be quoted	
13	Computer interface	Should be provided with documentation facility	
14	Accessories	Grinding balls of various sizes 2mm, 10 mm, 20 mm	
		Grinding jars of stain less steel	
		o ring of 10 set	
		Option for computer interdafce	
		Accessory for grinding under inert atmosphere	
		Consumable spare parts for 2 years for operation	

15	Others	Minimum 3 years compliancy warranty to keep the equipment in continuous working condition.
		Onsite training should be provided by the vendor at its own cost.
		In case of any up gradation of software within the period of warranty then the same should be provided free of cost by the supplier/manufacturer.
16	Warranty	• Minimum 3 years warranty must be provided

2021 - 22 / 07 / 10 - Polymerization Reactor			
Sl. No	Item	Unit	Specication
1.Reactor			
a	Volume	L	3.0 or equivalent
b	Heating/cooling jacket Max. pressure: Design pressure of Reactor	bar	350
c	Max. temperature(Design Temperature of Reactor)	°C	550
d	Other features		1. Reaction in reactor will be universal reaction with Batch process. 2. Feed properties: Viscosity /Density/latent heat/vapor load: as per polymerization reaction. 3. Reactor will have internal cooling coil and external electrical heating jacket. 4.Dip-tube provision in the reactor vessel should be provided
d	Jacket having bottom opening for Heating		Suitable electrical ceramic band heater to be provided.
2.Material			
a	Product touched parts (liquid and gas phase)		Made of SS 316 Seals of modified PTFE
3.Reactor System			
a	MFCs for N ₂ or Inert gas		
	i. Max. inlet pressure:	bar	370
	ii. Max. outlet pressure:	bar	350
iii. Flow rate:	lit/min		0.8 to 4 ltr/min or equiv. MFC for N2 or inert gas of 370 bar inlet & 350 bar outlet pressure is at inlet of reactor, N2 cylinder with regulator is in client scope.
b	MFC for Reactor outlet		
	i. Max. inlet pressure:	bar	200
	ii. Max. outlet pressure:	bar	150
iii. Flow rate:	ln/min		0.08...4 MFC for reactor outlet is for venting purpose. To maintain flow rate and it should sustain 200 bar pressure.
4	Heating system		Heating through external electric band heater
5	Cooling system		Separate chiller to be supplied for reactor cooling application which will be connected to the internal coil of the reactor.
	Display:		

6	Ø Temperature (displayed and controlled-thermostat)	To be provided
	Ø Speed (displayed)	
	Ø Agitator on/off	
	Ø Actual flowrate (displayed and controlled)	
	Ø Sum of dosed gas (displayed and controlled)	
	Ø HMI with PLC control system	
	Pressure	
Note :Design may by moderate		
7	Warranty	Minimum 3 Years Warranty must be provided
8	Training	Onsite training for system operation and maintenance as well as application support to be provided by the vendor at own cost.

2021 - 22 / 07 / 11 - Thermal Conductivity measurement apparatus			
Sl. No	Item	Unit	Specication
1	Equipment capable to determine measurement of Thermal Diffusivity, Conductivity and Specific Heat.	-	
2	Temperature range	°C	Minus 100 to 500 or equiv.
3	Thermal diffusivity range	mm ² /s	0.01 to 2000 or equiv.
4	Thermal Conductivity		0.1 W/Mk to 4000W/Mk or equiv
Accuracy			
5	Thermal Diffusivity	%	±3 or equivalent
6	Specific heat	%	±5 or equivalent
7	Heating rate	K/min	50
8	Pulse energy	J/Puls	10 Jules/puls variable
9	Pulse Width	µs	10 to 1500 or equivalent
10	Measurement temperature		Contact less with IR detector
11	Integrated automatic sample changer	Ø	4 x25.4 mm,16x12.7,16x10 or equiv
12	Sample holder:		1.For round and square sample 2.For liquid,pastes,resins,powders,laminates
13	Vacuum	m bar	Less than 150
14	Atmospheres:		inert, vacuum, Nitrogen
15	Workstation with accessories		Vendor should supply suitable computer system with complete accessories and UPS. It should have minimum of i7 (3.4 GHz, quad core) processor of latest configuration, 64GB RAM (2400MHz, DDR4), 1TB hard disk (7200 RPM), and 4GB graphics card or better configuration, with windows operating system and MS office recent version.
16	Accessories		1.Liquid nitrogen coolin accessories along with cryogenic cylinder setup to be provided 2.UPS of 5 KVA 3.Suitable Turbo pump to provided to create vacuum 4.MFC and internal pump to be provided
17	Computer system		Computer with suitable configuration to support the software and printer should be provided

18	Warranty	<ul style="list-style-type: none">• Minimum 3 years warranty must be provided with additional 3 years contract to keep the equipment in continuous working condition. Part no.s of all parts for which warranty is not applicable should be specified in the quotation.• AMC charges for additional 3 years to be quoted separately.
18	Training	Onsite training for system operation and maintenance as well as application support to be provided by the vendor at own cost.