Technical Specification for R & D Equipments

Hollow Fiber Membrane Spinning Unit (pilot scale)

S No	Specification	
1	Spnning unit	I. A pilot Scale Spinning Line for Hollow Fiber Membranes using solution spinning (by dry-wet phase inversion mechanism) of various polymers and solvents. II. Operation speed 2-25 m/min (or agreed upon) III. Bidder should provide information on model and make used in fabrication of spinning unit (such as pumps, regulators, controllers etc.)
2	System for Dope solution preparation and supply of spinning solution	I. Glass vessel capacity of about 1.5 liter or more useful volume (glass vessel should be heat resistant and should withstand upto 3 bar pressure)
		II. Glass vessel equipped with jacket, with flanged cover and a laboratory stirring unit with variable rpm for preparing polymer dope solution (along with rotor). Glass vessel should have provision for solids, solvent and nitrogen with thermometer, and bottom outlet valve.
		III. Max pressure : 3 Bar with stand capacity
		IV. Pressure regulator for adjustment of vessel pressure from 0.1 to 3 Bar along with connection hose between regulator and vessel including connection for nitrogen gas source.
		V. With digital air pressure display and control
		VI. With manual valve system for switching
		VII. Temp : 6 to 95 deg C with jacket system to maintain temp.
		VIII. Digital display and control to maintain temp
		IX. With Teflon tube to connect spinneret – length – 20 M
		X. Teflon tube size : OD : 6 mm x Id 4 mm
		XI. Provision for compressed nitrigen gas to dope solution tank
		XII. A Thermostat with temperature indicator: for heating the glass vessel, Vessel outlet i.e connection piping (vessel to metering pump, and metering pump outlet to spinnerate inlet piping conection) unit, with all necessary connection hoses and piping.
		I. 1 Metering pump, capacity 1.2 CC/ rev ?(or to be agreed upon)

3	Dope solution metering pump (spin pump)	II. Metering pump drive, complete with frequency controlled synchronous motor, infinitely variable rpm between approx 2 and 40, including telescope type double cardan shaft between motor and pump
		III. Speed indicator
		IV. Geared Motor : 460 Watt or any suitable Watt
4	Filter unit	I. Filter unit for fine filtration of the spinning solution, complete with jacketed filter housing for one cleanable stainless Steel filter element, micron rating 3 micron, filtering area approx. 12 cm2
		II. All necessary piping and connection to filter unit
5	Bore fluid solution tank and system	I. 1 Glass Vessel Capacity (1.5 liter)
		II. Max pressure : 3 Bar withstanding capacity
		III. Operating Pressure : 0.1 to 1 Bar
		IV. With digital air pressure display and control.
		V. With manual valve system for switching
		VI. Max temp : 6 to 70 deg C with jacket system to maintain temp
		VII. Digital Display and control to maintain temp.
		VIII. Bore fluid supply system should have pressure regulator, connection hose between regulator and tank, set of flexible connection hoses between bore solution tank , flow meter and spinneret holder.
		IX. Provision for compressed nitrigen gas to bore solution tank
		X. Flow meter with needle valve for dosing bore fluid range 0.02-1.2 l/h
		XI. With Teflon tube to connect spinneret – length – 20 M; Teflon tube size : OD : 6 mm x Id 4 mm or as standard required dimention and length
6	System for pressurizing the Fluid	I. System for both Bore fluid and dope tank
		II. Max pressure generation and operation upto 70 PSI
		I. 2 Single-component spinnerets of 55 mils OD x 32 mils ID and 32 mils OD x 16 mils ID
		II. MOC : Stainless Steel : 316
		III. With complete attachment to Dope tank and bore fluid tank and stand

7	Spinneret Unit	IV. Spinneret holder, jacketed for heating (6 to 70 deg C), for holding one spinneret (other spinneret designs incl. spinneret holder upon request), with support for height adjustment of the spinneret holder between about 5 mm and 400 mm above coagulation bath level
		V. Appropriate thermostat (with digital temperature controller having 0.1^{o}C accuracy) and jacket for heating and controling spinnerete temperature
		VI. Spinneret must be of very high quality having very smoth finishing without any machine/tool mark and capable of spinnning HFM of very high quality with consistent in reproducibility.
		VII. Spinneret should be supplied with appropriate and all necessary connections, seals and tubing and fitting.
8	Coagulation Bath	I. 01 Stainless Steel (grade 316) coagulation tank, deep design for vertical thread path, jacketed for heating and cooling, with height adjustable immersed idle change of direction roll of about 50 mm diameter with low friction ceramic hybrid bearings (or equivalent), wash water flow countercurrent through appropriate circulation pump via thermostat, and overflow
		II. Dimensions about – 1200 mm x 350mm x 800 mm (L x W x D)
		III. Coagulation bath temp. max upto 80 °C with temperature control
		IV. Filament guide roller approx Diameter : 50 mm and length 150 mm: - 3 nos or as required; MOC : PTFE
		V. Single heater heating system
		VI. Digital display to maintain the bath temp
		VII. A Thermostat for heating and cooling, of approproate capacity approx 4,000 Watt, with connection hoses to the heat exchanger coil at the coagulation tank
		VIII. Stainless Steel take up roll unit, roll diameter about. 75 mm, with idle thread displacement roll, with frequency controlled synchronous motor, infinitely variable take up speed between about 2 and 25 m/min, complete with stainless Steel support frame (connected to coagulation tank support i.e Thermostat for heating and cooling), stainless Steel front cover and dripping trough.
		IX. Provision for water drain (at bottom) and inlet (at bottom, counter flow to fiber spinning) in coagulation bath

9	Draw roller unit	Required nos. of Stainless Steel take up roll units, roll diameter about. 75 mm, with idle thread displacement roll, with frequency controlled synchronous motor, infinitely variable take up speed between about 0 and 25 m/min, complete with stainless Steel support frame (connected to coagulation tank support), stainless Steel front cover and dripping trough.
10	Wash bath-	02 Nos. Stainless Steel 316 wash bath tank, shallow design with inner electric heating coil, coil covered with protective removable perforated stainless Steel sheet, tank dimensions about 900-1200 mm length, 500 mm width and 130 mm height, wash liquid flow countercurrent (through suitable pump), with supply distribution pipe and overflow (drain and inlet valves at bottom of bath)
		Idle wash bath rolls, completely immersed in the wash bath tank with low friction ceramic hybrid bearings, roll length about 420 mm, roll diameter about 25 mm, one roll with adjustable inclination for displacement of the thread
11	Take up roll unit	Required nos. of Stainless Steel (SS 316) take up roll units, roll diameter about. 75 mm, with idle thread displacement roll, with frequency controlled synchronous motor, infinitely variable take up speed between about 0 and 25 m/min, complete with stainless Steel support frame (connected to wash bath tank support), stainless Steel front cover and dripping trough.
12	Technical drawing	Supplier must provide complete and detail schematic technical drawing with all dimensions of HFM spinning unit indicating all parts, fitting, piping, pressure regulator, thermostat, pupms, motors, tanks, valve, indicator, regulator, support, controler, spinneret etc.
13	Winder	Speed range 0 to 25 MPM with VFD
		Motorized thread guide to uniform winding of filament
		Single Bobbin : Size : 150 mm W x 400 mm Dia
		Geared motor driven system for easy operation
		With minimum Dipped in water : 2/3rd level
15	Control panel unit	I. Control panel section - Touch screen (PLC controlled) Make: Schneider or equivalent with auto control of all parameters

		II. Drive consist of panel: 1 HP drive : 7 Nos : Make :Schneider or similar
16	Others	I. Spinning machine should capable of producing HFM and solid fiber of commercial standard in continuous fashion
		II. Supplier should provide all necessary parameter indicators, controllers and accessories
		III. Supplier must fully demonstarate UF type HFM (of high quality) spinning by using polysulfone, PVDF, PAN dope solutions during the installationcommissiong.
		IV. Any technical issues with spinning unit must be resolved during predilivery inspection and during installation, commisioning and demonstration.
		V. All parts of spinning must be of very good surface and inner finishing without any machining and tool marks.
		VI. Spinneret holder must be able to accommodate different spinneret design like bi-component spinneret, single-component spinneret of differint dimensions for furtue apgradation.
		VII. Supplier should provide all necessary component and system required for continuous prepration HFM.
		VIII. Support frames/stands for dope solution, bore solution, spinneret holders etc. of SS 316 with perfect finishing and polishing without visual weld mark, machine mark.
		IX. Complete system must be stand alone unit with appropriate support stand (SS 316) having movable trolly stand for different components of system such as coagulation bath, wash bath, winder etc.
17	AMC	Annual Maintenance Contract shouls be quotes separately for three years after completion of warranty period

XENON ARC WEATHEROMETER

S.No	Items	Specification
1	Chamber Type	Rotating rack
2	Specimen Capacity (nos.)	100+
3	Specimen Orientation (measured from horizontal) (˚)	90
4	Exposure Area (cm^2)	10,000+
5	Rack Type	3 tier or more

6	Specimen holder	Atleast 3 different sets of sample holders should be provided to accommodate different types of samples such as rigid plastics, plastics films, textiles, paper/cardboard, foam, rubber sheet, leather, photovoltaics, etc.
7	Standards	Should comply with all available ASTM, ISO, MIL, JIS and GB standards related to Plastics, Fibers, Textiles, Elastomers/Rubbers, Latex, Adhesives, Sealants, Coatings, Paints, Printing Inks, Colorants, Paper/Cardboard, Foam, Leather and Polymer/inorganic hybrid composites
8	Irradiation source & Wattage	Xenon arc lamp (5000- 12000 W)
9	Typical Average Lamp Life (Hours)	Above 1500
10	Light Filters	Suitable Interchangeable filters (for inner and outer)
11	Irradiance Control	Automatic Microcomputer for narrow band (340 nm/420 nm), broad band (300-400 nm) or illuminance control/LUX (400-750 nm). Filter combinations to meet all common test methods
12	Irradiance Range (W/m^2)	0.2 - 180
14	Humidity Control	Automatic Proportional control with Direct RH Sensor
15	Temperature Control (˚C)	Automatic smart control system
18	Chamber Temp (˚ C)	Light Cycle (any filter)- 30-70 °C, Dark Cycle- 15-60 °C through air circulation
20	Compressed Air	Should be fulfilling the requirement of all the specified standards.
21	Xenon lamp system	Calibrated lamp with cooling system. Calibration certificate with traceability sgould be provided
23	Blower Speed Control	Automatic
24	**Software and Display**	
	Pre-Programmed Test Methods	minimum of 10 pre-programmed standard test methods
	Display	Color display monitor with all control features
	Data storage features	Sufficient data storage space
		Provisions to take snapshot during test
		Provision for connection with a workstation to be provided
	Programmable controls	Setting black panel temperature, relative humidity, specimen chamber temperature
25	Test countdown	Automatic w.r.t time or radiant exposure
26	Water filtering system	System should be capable of fitering water to a high purity level (resistivity > 1 mega ohms.cm). Should be equipped with automatic water indicator and alarm system.
27	Compressor	Suitable compressor for smooth running of the equipment

28	Radiometer	To measure radiant flux for self calibration to be provided (Calibration certificate with traceablility should be provided)
29	Data output	Ethernet or USB port
30	Dust filter type	Air Intake
31	Essential Accessories	Atleast 3 different sets of sample holders
		2 spare xenon lamps
		Leg extensions
		Xenon lamp cooling system
		Chamber lock
		Filter lantern
32	Workstation	Latest Windows based, Reputed Branded Computer with B/w Laser Jet Printer
33	Installation requirements	State space required and condition of floor and any other requirement for installation of the machine/ equipment.
34	Installation &Training	Minimum of 2 days training for atleast three technicians
35	Manufacturer's credential	Should have sizable installations of same model worldwide and at least two same or similar model
36	References	Tenderer shall give provide contact details of existing customers having such supply in India.
37	Safety requirements	The machine or set of machines supplied to meet objective shall be able to operate without
38	Spares and consumables	Tender shall include details of list of all essential spares and consumables along with quote.
39	Price list of spares and consumables	Price list of each material with minimum quantity, spares and consumables are to be quoted.
	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.
40	tools and accessories	Appropriate toll box/kit for routine maintennance to be provided with the equipment
		All documents (i.e. operating and service manuals, drawings etc.) and original softwares relevant to the instrument and its accessories should be provided
41	Scope of supply	Tenderer will supply complete start up package necessary to prove the machine and provide

PROGRAMMABLE MUFFLE FURNACE

S.No.	Description	Specifications
1	Controls	PID Based Digital Temperature Controller and programmable timer up to 99 hr 59 minute
2	Working Range	amibent to 1100°C
3	Least Count & Accuracy	1^{o}C & 0.5 % of set temperature

4	Heating element	Silicon carbide (SiC) / Molybdenum Silicide ($MoSi_2$)
5	Heating rate	Fast heating rate and the maximum temperature should be attained as a ramp function within 1 hour Assured uniform heating inside the chamber
6	Furnace	Fire Bricks Insulated Muffle Furnace. Door opening on front side. / Powder coated outer body
7	Chamber size (Minimum)	6 inches x 6 inches x 12 inches or larger
8	Accessories	Standard accessories including **platinum crucible**, silica crucibles, Safety switch on door, Temperature Chart Recorder, Extra port for gas, Extra heating element & rod with clips, Extra thermocouple, Tongs, & Gloves to be provided. quote should include all the above items.
9	Other mandatory items	User Manual, Calibration certificate of NABL Laboratory with NIST traceablity

Laboratory TOC Analyzer

Sl. No.	System/parameter	Specifications
1	Instrument	TOC analyzer must be capable of measuring total organic carbon (TOC), Total carbon (TC), total inorganic carbon (IC), non-purgeable organic carbon, volatile organic carbon, total nitrogen (TN) in aqueous and solid samples
2	Modules	I. TOC Analyzer
		II. Total Nitrogen module
		III. Solid sample module
3	Operating principles	I. Catalytic combustion at high temperature (about 670 Degree Celcius or better
		II. It should be PC controlled
		III. Nondispersive IR analyzer
4	Measuring range	I. TC: 5 µg (or less) to 3, 000 mg/L or better
		II. IC: 5 µg (or less) to 3,500 mg //L or better
		III. Volatile organic carbon: 5 µg (or less) to 500 mg/L
		IV. Measurement accuracy: 1.5%CV (max) or better for entire range
		V. Measuring time: 3 to 4 minutes
		VI. Sample injection: Sample injection using microliter syringe manually as well as with autosampler
		VII. Sample injection volume: 10-20000 µl
		VIII. IC treatment: Automatic internal acidification and sparing
		IX. Dilution rate: 2x to 50 x
		X. Dilution accuracy: ±2% or better
		XI. Carrier gas: High purity air

		XII. Supply pressure: 200±10 kPa
		XIII. Gas consumption: 200 ml/min or less
5	Nitrogen module	I. Chemilumiescence measurement method
		II. Measuring range: 0-10,000 mg/L
		III. Detection limit: 5 µg/L or better
		IV. Accuracy: 2%CV or better
		V. Measurement time: about 3 to 5 min
		VI. Ozone gas source: Air
6	Solid sample module	I. Measurement principle: Combustion catalytic oxidation (TC), Acidification (IC)
		II. TC furnace temperature: 900 Degree Celcius
		III. Measurements: TC, IC, TOC
		IV. Measuring range: TC: 0.1 to 30 mg carbon; IC: 0.1 to 20 mg Carbon
		V. Sample size: 1 g or less
		VI. Analysis time: 5-6 minutes
		VII. Carrier gas: High Purity Oxygen gas
		VIII. Oxygen Gas consumption rate: 550 ml/min or less
		IX. Soild sample combustion unit
7	PC	I. A Branded PC with Intel core i3 10th generation with all necessary lisence softwares for OS, Instruments etc.
		II. Minimum 4 USB ports, 1 TB SSD; RAM 8 GB; OS Window 10 professional; 2 GB grraphic card; TFT lCD screen
		III. Shold have all data acqusition capabilities
8	Others	I. Should quote and provide all other accessories required clearly for operating instrumnt in full capacity
		II. Should provide standard samples for aqueous and solid for IC, TOC, TC, Nitrogen and volatile carbon.
		III. Coagulation bath temp. max upto 80 °C with temperature control
		IV. Should provide NIST tracable calibration certificates for standards
		V. Should provide details of catalyst life time in termas of sample analysis
		VII. Should provide sufficient catalyst to operate instrument for at least two year
		VIII. Should provide sample preparation kit with sample filtration
		IX. Should provide required Air and gas cylinders with regulators
9	Standards	Should meet ASTM D8083-16 and ASTM D7573 requirements
10	Other provisions	Each module should capable of automatic setting of optimal measurement conitions; Automatic selection of the optimal calibration curve; and Automatic changing of conditions and re-measuremnts of ou-of-range samples

FIELD EMISSION SCANNING ELECTRON MICROSCOPE (FE-SEM) WITH EDS

Sl. No.	System/parameter	Specifications
	Applications	To study morphological features of polymers, ceramics, metals, composites, biomaterials and multiphase polymer systems.
1	Electron Gun	II.Schottky Field Emitter with High brightness.
		III. Filament or its replacement must be provided for at least 3 years from the date of installation
2	Accelerating Voltage	Upto 30 kV or better (continuously adjustable)
3	Resolution	I. Resolution with in-beam/in- lens SE Detector
		II. 0.8 nm or better @ 15 kV
		III. 1.0 nm or better @ 1 kV
		IV. The definition of resolution and the method used to determine the resolution should be clearly specified and resolution should be determined at the site of installation on standard gold on carbon sample at supplied accelerating voltage
4	Magnification	20x (or lower) to 10,00,000x or better
5	Probe current	Suitable for all applications. Upto 100 nA
6	Imaging Modes	(I) SE, (II) BSE
7	Detectors	SE detector, BSE detector and In-column or In-lens detector with beam deceleration (BD)
8	Vacuum System	I. Suitable vacuum systems having Ion getter Pump/sputter ion Pump, Turbo molecular Pump and Rotary Pump/Oil free/Dry Scroll Pump must be provided.
		II. All necessary gauges and valves must be included. Pump down time should be 5 minutes or less.
9	Chamber	I. Chamber should accommodate a sample size of 1.5 cm x 1.5cm or more.
		II. Minimum number sample Ports: 8 or more; and capable for future expansion
		III. Details of chamber dimensions to accommodate the above sample size for characterization should be clearly indicated
10	Sample stage	I. PC controlled 5 axis motorized stage. (X ~100 mm, Y ~80mm, Z=25 mm Tilt=0-60° R=360° Ease for specimen exchange.
		II. Ease for specimen exchange.
		III. Stage movement should be controllable through both computer and manually with joystick.
11	Sample holder	For adding 8 or more 1 cm2 samples
12	Camera	CCD camera with IR illumination for in chamber viewing
		I. System should be compatible with EDS.

		II. Detector size/Chip size: 30 mm2 or more
		III. Resolution: 129 eV or better@ Mn Kα
		IV. Detection from B(5) to U(92).
		V. LN_2 Free, Peltier cooled detector
13	EDS system	VI. Supplied EDS server and analysis software should be capable of performing data acquisition storing and transfer in common windows based application formats, qualitative & quantitative analysis, line scanning, elemental or dot mapping including spectrum imaging and phase mapping with specimen drift correction.
		VII. Standard samples for calibration should be provided.
		VIII. Interactive ZAF/PB and Phi ρ z based quantification software with tilt correction and manual background correction and peak deconvolution as an integral part of the the software.
	Data storage, analysis softwares and PC	I. Suitable hardware and software for equipment control, data acquisition and analysis.
		II. 2 no. of branded PC with i7 10th generation or better with 2 TB SSD, 8 GB graphic card, minimum 6 USB ports; DVD drive; minimum 8 GB RAM; OS: Wondow 10 professsional or advanced version
		III. 24-inch HD LCD or LED Screen: 02 no.
		IV. Image size: 5120 X3840 pixel or better.
		V. Image depth: up to 16 bits or better
14		VI. Image format: BMP, TIFF, JPEG, JPEG2000, GIF, PNG, etc.
		VII. Software should be capable of automatic generation of report in MS- Office. MS-office be provided.
		VIII. Image acquisition system should be compatible with Windows 10 or recent operating system version of windows.
		IX. No public domain software is acceptable. Manufacturer must offer their licensed software developed by them. Updates to the instrument control/data collection and automated structure solution and refinement software will be provided as available free of charge and in perpetuity.
		I. Sputter coater system: Metal Sputtering and Carbon coating system to be provided.
		II. Metal Target: Au, Pt, Au-Pd to be provided,
15	Sputter Coater system	III. Vacuum pump and other necessary items to be provided.
		IV. 01 set of additional/spare targets to be required.
		I. Sample holders for 6- inch wafers – 2 Nos.

16	Sample holders and consumable	II. Cross section and tilted sample holders – 5 Nos. each of 45˚and 90˚
		III. Pin/regular stubs 1 inch – 50 numbers
		IV. Conductive carbon adhesive tapes – 5 Nos.; (Length: 20 m; Width: 8mm – 1 No.; 10mm – 2 No.s; 20 mm – 1 Nos.; 50 mm – 1 No.)
17	**Essential Accessories**	I. A filament replacement warranty card.
		II. Track ball for imaging operations/ Joystick/ Control panel
		III. Touch alarm safety detector for specimen stage and detectors.
		IV. Remote control hardware & network software for on line fault diagnosis using internet TCP / IP open protocols.
		V. All essential commissioning and operating accessories like Air compressor, Chillers etc., to be provided
		VI. Essential tool kit to be provided
		VII. A suitable 10 KVA or more UPS for 1 Hour or more backup on full load to be provided
		VIII. Suitable printer
18	Standard/ calibration samples	I. Standard samples such as Co, Mn, Gold magnification standard Faraday cup, a brass duplex standard for BSD calibration, etc. should be provided for calibration.
		II. Should provide other optional standard samples (no. should be mentioned with details)
19	Installation and training	I). After installation one week of through training must be provided on site. Details should be indicated.
		II) Installation must include:
		Resolution check.
		EDS resolution check; 129 eV or better; Mn Kα and also detecting B(5) to U(92).
		Operation using standard samples on all modes of imaging
		Elemental mapping, line scan, etc. in case of EDS
		Standard samples requires a certificate from standard certifying bodies
		Complete set of manuals on operation, maintenance of the system in hard copy as well as soft copy should be provided in English exaclty for quoted model only.

20	General	I. FESEM quoted must be compete in all respect with state-of-the-art technology. It should have capability to image thin films, polymers, ceramics, semiconductors and magnetic specimen at high mag. FESEM should have suitable technology for optimum performance of all the detectors particularly In-Lens SEI.
		II. The quote should include all accessories required to image. Thin films, polymer, ceramics, semiconductor and magnetic samples etc.
		III. FESEM should include safety devices for protection against Failures in vacuum, water, power etc.
		IV. Should provide all others accessories and consumables required for installation of instrument (also mention detils of other accessories)
		V. Site visit, site preparation etc. should be included for successful instllation and operation of instrument
21	ACMC	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. Technical support personnel must have adequate experience in this field. Technical support personnel details should be submitted. Name and address of the authorized service centre/ partner in India along with the certificate of authorization should be attached. ACMC should be quoted for 3 years after warranty period
22	EBSD system	I. System should be compatible with EDS.
		II. Speed of 800 points/sec in 8X8 binning mode. Speed of 620 points/sec in 4X4 binning mode. Angular resolution of 0.5 degrees at 300-400 pts / sec speed
		III. Software should include (i) camera optimization for data collection (binning, brightness and gain), (ii) background collection and subtraction, (iii) point analysis (for collection of patterns from multiple spots in a given area and Off-line analysis.
		IV. The EBSD software should be able to index all seven crystal systems (metallic, ceramic, semiconductor, minerals and rock samples).

		V. The EBSD software should also have capabilities for dynamic mapping (for producing orientation and phase maps with SEM image with pie charts showing phase and structural information) to ensure data collected matches data needed.
23	Imaging	Software for 3D tomography and imaging
24	Attachment for in-situ electrical measurements while viewing using SEM	This system is to be installed in SEM stage and measures 4 point local electrical conduction. The probes for I-V measurement should have following specifications
		I. No of Probes: 4
		II. Degrees of freedom: 3 independently driven (X,Y,Z) perprobe
		III. X-Y scan range: Max 10mm × 10 mm in step of 200nm each
		IV. Z scan range: Max 5mm in step of 200nm
		V. Movement resolution: Better than 50nm
		VI BNC on feed through for electrical measurements
4	Extended warranty	Extended warranty for another two years
Note: Any other accessories including optional accessories apart from essential accessories and		

Particle Size and Zeta Potential Analyzer

Sl. No.	Description	Specifications
1	Applications	Nanoscience applications; particle size analysis of polymer, nanoparticles, dispersion, emulsions, suspensions, Ceramic nano, etc. in both organic and aqueous media. Application in petrochemicals and pharmaceuticals
2	Mode of operation	Wet mode (suspensions, emulsions, dispersions)
3	Capabilities	Machine should be capable of analyzing Particle size, Zeta Potential, Molecular Weight, Static/Dynamic Light Scattering and Second Virial Coefficient
4	Laser	Standard laser
5	Size range	For particle size range of detection: 0.3 nm to 10 µm or better
		For zeta potential range of detection: 4 nm to 100 µm or better
6	Control system	Automated measurement
7	Volume units	User Exchangeable volume units
8	Presicision	Should be at least ±10% or better
9	Detectors	Suitable detectors

10	Data display and interpretation	Data display and interpretation unit must have facility to generate reports like size distributions, density distributions, cumulative distribution, percentages, tabular, logarithmic, normal distributions.
		The computer system should be capable of showing good quality images along with a laser printer
11	Angular range	15 or less to 170 degrees or more
12	Time	Measurement time must be less than 30 seconds
13	Temperature range	Temperature Control Range: 0 degree to 90 degree celcius or better, Ambient Operating Temperature Range: 10 degree to 35 degree celcius or better
14	Software	Software should run stand-alone for off-line data analysis and other measurements, with guaranteed protection of original measurement data. Real time display of particle size, measure Zeta Potential, Molecular weight, and static/dynamic light scattering, Second Virial Coefficient, Statistical analysis etc.The software must have the ability to be automatically updated, and should not need changing at all.
15	**Essential Acessories**	
	Vacuum cleaner	Bidder should specify and quote suitable systems with full details. The computer must be a branded PC with the latest operating system and clear display. The printer should be a laser printer. The UPS should have the ability to
	Air compressor	
	Computer with ups & Printer	
	UPS for the machine	
	Consumables/Spares	
16	Any Other options	Bidder to specify and quote if any other accessories available /required for smooth running of the equipment
17	Terms & Conditions	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.
		Manufacturer of the supplied equipment must be ISO Certified
		Authorization Letter from OEM
		List of clients in last five years to be provided.
		Manufacture/Supplier should have sizable installations of same model worldwide and at least five in India.

18	Scope of supply	Bidder should submit complete scope of supply (Equipment, standard acessories, Optional Acessories, etc. with make & model) in the technical bid with price. Bidder should supply complete start up package necessary to properly run the machine (as per the specified requirement) and provide training.
19	**INSTALLATION, COMMISSIONING AND TRAINING**	
20	Installation and requirements	Bidder should state the space required and condition of floor and any other requirements for installation of the machine and equipments. State clearly the specifications of electical requirement. Vendor should carry out installation and commissioning of the machine and its accessories on a turnkey basis.
21	Training and documentation	Minimum of 5 days training for five persons, which includes basic & advanced level training. Training content and plan to be submitted. Training faculty must have adequately experienced in this field.
		The vendor should supply the necessary manuals, such as
		· Software instruction
		· Maintenance and trouble manual
		· Training
		· Installation and Commissioning
		· Handling of accessories
		· Software key (if any)
		· Software CDs
22	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. Technical support personnel must have adequate experience in this field. Technical support personnel details should be submitted. Name and address of the authorized service centre/ partner in India along with the certificate of authorization should be attached.
23	Annual Comprehensive Maintenance Contract (ACMC) I	Vendor should quote for Annual Comprehensive Maintenance Contract for the whole system and accessories supplied after the completion of performance warranty period. Supplier has to provide service support within 48 hours. Calibration of the machine shall be a part of warranty and ACMC. It shall also be mandatory to perform calibration after every major repair or breakdown.

UV WEATHEROMETER

Sl. No.	Description	Specifications
1	Purpose	To expose the polymeric product to UV light (UVA & UVB wave length range), to study the UV stability as per ASTM & ISO standards
2	Principle/ Definition	Simulating the weathering conditions of the given material and analyze the properties.
3	Reference Standard	ASTM G 154, ASTM D 4329, ASTM D 4587, ASTM D 5208, ISO 11507
4	Effective radiation area	4000 cm^2
5	Components surface temperature	45 ^oC - 80 ^oC for UV Cycle 45^oC -60^oC for condensation
6	Temperature accuracy	± 0.1 ^oC or better
7	Temperature resolution	1 ^oC or better
8	Temperature controller	Black panel Temperature
9	Centre distance of lamp	5 cm
10	Humidity	100%
11	Light source	UV Fluorescent Lamp
12	Wavelength	UVA (340 nm) & UVB (313nm)
13	Temperature sensor :	Black panel
14	Minimum sample holder plates	Aluminum Plates 24 sample holders
15	Water spray system	Water spray system consisting of spray nozzle, piping control & drain.
16	Conditioning cycle	Light cycle and Condensation cycle
17	Irradiance Calibration	Irradiance calibration (calibration radiometers for periodical calibration) with NIST traceability (UVA & UVB)
18	Irradiation Control	Irradiation control (solar eye automatically maintain light intensity through feedback look this controller monitor UV intensity and compensate lamp aging or any other variability by adjusting power to the lamp) with NIST traceability
19	Other built –in features	· Easy programming of cycles, temperature checking and status performance with proper safety controls.
		· Self diagnostic system for complete error checking and performance status should be displayed.
		· The built-in calibration includes lamp calibration service or maintenance.
		· The system shall be able to stimulate Heat, Rain and Dew conditions as per requirements of various standards.
		· Data Acquisition Program via Ethernet
		While supplying the Machines, the supplier should also provide the following items apart from above:

20	Other Mandatory Items	· Hard copies of Operational & Service Manual- 01 Set..
		· Machine should come with all other essential accessories & spares required for installation, commissioning& Operation
		· Onsite Training to be provided for officers at commissioning site.
21	ACMC	AMC should be quoted for three years after warranty period

Automatic Viscosity measuring system

Sl. No.	Description	Specifications
1	Applications	To measure the viscosity of polymer solution by measuring the time taken for a defined quantity of fluid to flow through a capillary with a known diameter and known length using Ubbelohde viscometers, for polymer soultion, pharmaceutical etc.
2	Module	PC controlled Automatic Viscosity Measuring system with ubbelohde capillary viscomters for series dilution measurments with with a waste system.
		Pressure and suction mode operation for the same system
		Software
		Basic unit, Pump module for opto electronic sensing
		Opto Electronic Measuring stand
		Safety Bottle Holder-Suction mode of operation: 02 no.
		Safety Bottle : 02 no.
		Cap suction : 04 no.
		Cap Venting : 04 no.
		Connecting Tubes for pump-Safety Bottle, pump-Venting and for Safety Bottle to Viscometer : As per actual requirement
		Connections: Pneumatic connections, Electrical connections, Mains connections, and Pump connection should be standard
		A suitable branded PC
3	Measuring range (time)	up to 9,999.99 s; resolution: 0.01 s
4	Measuring range (viscosity)	Pressure: 0.35 to 1,800 mm²/s; suction: 0.35 to ~5,000 mm²/s
5	Ubbelohde for dilution viscometry not calibrated, for automatic measurements	Total range 0.35 mm^2/s to 60 mm^2/s
		Capaillary tube with Constant K values of 0.001, 0.003, 0.005, 0.01, 0.03, and 0.1: 01 no. for each K values
6	Bracket to Position Capillary	02 no. made of SS 316

7	Temperature viscosity Bath : 01 no.	Temp. Range: RT to 100 deg C; Resolution:0.1 Deg C; Temperature Selection: digital
		Temperature stability:+/-0.1 Deg C
		Temperature Display: LCD Display
		Temperature Selection: Digital
		Digital Auto Start: Provided Low Liquid level Protection
8	Cooling thermostat to be used with viscosity bath: 01 No	Temp. Range: -20 to 40 C
		Temp. Stability:± 0.1 deg C Temp. Display: Digital TFT Display Resolution:0.1 Cooling Capacity: 350 W at 20 deg C
		Microprocessor controlled
9	Other esseential requirements	Pump pressure: automatically controlled
		Pneumatic connections threaded connections for viscometers
		Data Input/Output serial to EIA RS232-C
		Housing Material: coated aluminum plate
		Measured parameter flow through time [s] Accuracy of the time measurement ±0.01 % Measured value display via PC Display accuracy ±1 digit (0.1%) Pump pressure automatically controlled

End Fittings for Pipe Testing

Material of Construction - M.S. Hard Chrome Plated clamps with M.S. Hard chrome locking Plug (20-110mm). Aluminium with silver paint clamps with M.S. Hard chrome locking plug(abpve 110mm)

Sl no.	Item Description	Technical Specification
1	End Fittings	16mm - 1no.
2	End Fittings	20mm - 1no.
3	End Fittings	25mm - 1no.
4	End Fittings	32mm - 1no.
5	End Fittings	40mm - 1no.
6	End Fittings	50mm - 1no.
7	End Fittings	125mm - 1no.
8	End Fittings	140mm - 1no.
9	End Fittings	160mm - 1no.

Dynamic Mechanical Analyser (DMA)

Sl.No.	Despcription	Specification
1	Temperature Range	from -150^{o}C to 500 ^{0} C or better on both side
2	Temperature Resolution	0.1 ^{0} C
3	Heating Rate	0.1 to 20 ^{0} C/min or higher
4	Cooling Rate	0.1 to 20 ^{0} C/min or higher

5	Cooling system	Automated cooling system should be provided to achieve the specified low temperature
6	Force Range	18 N (Max) and 0.001N (Min)
7	Force Resolution	0.0005N or better
8	Tan δ Range	0.0001 to 10
9	Resolution	1.0×10^{-4}
10	Sensitivity	1.0×10^{-3}
11	Sample Deformation modes	Single and dual cantilevers
		bending modes: 3-point bending mode
		Tension and compression modes
		Shear Mode
		(Fixtures should be provided to all modes)
12	Sample Deformation Range	1 mm to 1 cm or better
13	Amplitude resolution	10 µ or better
14	Modulus Range	10^3 to 10^{10} Pa or higher
15	Modulus Resolution	0.01 Pa
16	Frequency Range	0.001 to 200 Hz or higher with minimum of 0.01 Hz increment or better
17	Liquid Nitrogen Dewar	Dewar of capacity of 50 ltr or better should be provided in the system
18	Other	· Humidity Controller in the chamber
		· Provision for control flow of N_2 or Air
		· Calibration Standard Kits should be provided
19	Software	compatible to Windows 10 OS and should have the capabilities to programme stress, strain, amplitude etc.
		capable of collecting data on storage, modulus, loss modulus, tan delta, complex modulus, complex / dynamic viscosity, creep compliance, etc.
20	Workstation	Branded Desktop PC (i7, 8 Gb RAM, 1Tb HDD 21 " LCD display,) Inject colour Printer & Branded UPS
21	Accessories	Biddere to specify and quote any ther accessories rerquired for the better unilisation of the equipment
22	Scope of supply	Bidder should submit complete scope of supply (Machine, standard acessories, Optional Acessories etc with make model) in the technical bid withour price.Bidder should supply complete start up package including material necessary to prove the machine and provide training.

Dielectric Thermal Analyser (DETA)

Sl.No.	Despcription	Specification
	Applications - Investigation of the curing behavior of thermosetting resin systems, composite	
	Ø Suitable for films, liquid and powdered materials.	

	Ø To determine glass transition of delicate polymeric films and membranes.	
	Ø To study the dependence of temperature and frequency on dielectric properties.	
	Ø Provide information on capacitance and conductivity of materials.	
Technical Spec.		
1	Frequency range	12Hz to 200kHz Up to 50 frequencies in same experiment
2	Temperature range	-150°C to 350°C or better
3	Ramp Rate	2^{o}C/minute
4	Heating/Cooling rate	Heating rate 0 to 20°C/min
		Cooling rate 0 to 40°C/min
5	Coolant	Automatic cryomode for measurement at sub ambient temperature using liquid nitrogen including dewar flask of 50 litre capacity (should be supplied along with instrument)
6	Voltage range	0.005 to 20 V
7	Electrode type	Ø Parallel plates: 10mm, 33mm, 40mm
		Ø Cup: 40 mm
8	Data acquisition /operating system	Ø System should be capable of determining the dielectric constant, permittivity, loss factor, dissipation factor, glass transition, and other secondary transitions with the DETA.
		Ø Should have DETA data system which is based on Microsoft Windows10 operating system for instrument control, data acquisition, data analysis, quantization, automation & customization with online and offline sessions provided.
9	Voltage range	AC: 0 mV to 1.3V in 5mV step
		DC: 2V internal DC Bias and 30V external Bias 200mA max
	Capacitance range	10pF to 10 µF
11	Dynamic impedance	10^{-5}W to 10^{5} kW
12	Tanδ resolution	> 0.0001
13	Humidity control chamber	20°C to 90 °C
		Dry purge gas
14	Ø Should be equipped with an efficient furnace for precise temperature control. Liquid nitrogen can be easily connected (automatic mode) to allow for sub-ambient measurements.	
	Ø Bidder should specify the sample thickness and dimension	
Essential Accessories		
1	Branded latest 10th gen i7 PC compatible with DETA system having 2tb HDD and 2 gb	
	UPS: 5-7 KVA UPS with at least 60 min back up is needed.	
2	Mechanical accessories (tool-kit etc.) and consumable spares for the operation	
Other terms and conditions		
1	The system must be factory tested and a certificate should be provided.	
3	The entire system should be installed by the company professionals at our site. A thorough	

4	A list of references in India, where similar systems have been installed, must be provided	
6	The entire system should be installed by the company professionals at our site. A thorough	
7	ACMC should be quoted for three years after warranty period	

CONE CALORIMETER

Sl.No.	Despcription	Specification
1	The Cone Calorimeter should be capable of measuring:	
2	Ø Heat Release Rate	
3	Ø Mass Loss Rate	
4	Ø Time to Ignition	
5	Ø Effective Heat of Combustion	
6	The apparatus should meet the standards prescribed in ISO 5660 and ASTM E 1354.	
7		
8	**FEATURES**	**DESCRIPTION**
9	Conical Heater	Ø The heater element should be rated at 5 kW (or better) at 240 V
10		Ø The heater should be able to produce uniform irradiance over the range 0 to 100 kW/m2 (or more)
11		Ø The heater should be encased on the outside with a double-wall stainless steel cone, packed with a refractory fiber material of approximately 100 kg/m3 density
12		Ø The heater should be capable of horizontal and vertical orientation arrangements
13		Ø The heater should have three K-type stainless steel sheathed thermocouples, connected but not welded to heater element
14		Ø The heater should have a shutter mechanism (automatic or manual) to protect the sample area before the test
15	Temperature Controller	Ø The temperature controller for heater should be capable of holding the element temperature steady to within ± 2°C or better, over the range of 0°C to 1000°C (or better) using a suitable 3-term PID controller and thyristor unit capable of switching currents up to 25 A at 240 V
16	Ignition Circuit:	Ø External ignition should be by 10 kV discharge across a 3 mm spark gap
17		Ø A power source should be a transformer designed for spark-ignition or a spark generator

18	Load Cell	Ø Load cell should be compensating for imbalance in the fuel
19		Ø It should have a readout resolution of 0.1 g or better
20		Ø Total weighing range of minimum 3.5 kg of which more than 500 g should be available for direct monitoring during single test
21	Specimen Mountings:	Ø The specimen holder should be manufactured from 2.5 mm thick stainless steel material
22		Ø The inside dimensions of holder should be 100 mm×100 mm and 25 mm height
23		Ø Retainer frame and wire grid arrangements for specimen holder should be provided
24	Heat Flux Meter	Ø Gardon or Schmidt-Boelter type heat flux meter to calibrate the heater temperature controller
25		Ø The design range should be at least 0 to 100 kW/m2 with an accuracy of ± 3 %
26		Ø The sensing surface should be circular and flat
27		Ø The flux meter should be water cooled
28	Calibration Burner:	Ø Calibration burner to be provided to calibrate the heat release rate of the apparatus using methane of at least 99.5% purity
29		Ø Mass Flow Controller (MFC) to control the gas flow is preferred.
30	Exhaust System	Ø The exhaust system should consists of a variable speed exhaust blower capable of developing flow over a range 0.012 to 0.035 m3 /s
31		Ø A restrictive orifice of 57 mm inside diameter should be placed between the hood and the duct for mixing and a sharp-edged orifice of 57 mm inside diameter should be located at least 350 mm downstream from the blower as per ASTM E 1354, ISO 5660
32		Ø The duct should be 114 mm inside diameter and manufactured from 0.6 mm thick stainless steel plate
33		Ø K-type stainless steel sheathed thermocouples to measure temperature of gas stream
34		Ø Material of complete exhaust system should be stainless steel

35	Smoke Detection System	Ø Helium-Neon laser beam (0.5mW, 633nm) system, silicon photodiodes as a main beam and reference detectors.
36		Ø 2 number of ND filters for calibration with optical density anywhere between 0.1 to 1
37	Gas sampling and analysis system	Ø Capable of measuring O2, CO2, CO
38		Ø Should incorporate a ring sampler, soot filter, cold trap, pump, desiccant, bypass system and flow controller
39		Ø The gas sample lines should be constructed noncorrosive material like nylon and plumbing should be using Swagelok fittings
40		Ø The gas sampling & analysis rack should be modular for use with both cone calorimeter and well as large scale calorimetry.
41	O_2 Analyser	Ø Paramagnetic type gas analyser with a range of 0 to 25 % oxygen
42		Ø The analyser should exhibit a linear response
43		Ø The drift of not more than ± 50 ppm of oxygen and noise of not more than 50 ppm of oxygen (root mean square value) over a period of 30 min.
44		Ø The analyser should have 10 to 90% response time of less than 12 s
45		Ø Intrinsic error (accuracy) should be less than 0.02% Oxygen
46		Ø Absolute pressure transducer arrangement for analyser
47	CO_2 Analyser	Ø Non-dispersive Infra-red (NDIR) type with a range of 0 to 10 % CO2 (v/v)
48		Ø The response time should be less than 20 s
49		Ø Intrinsic error (accuracy) should be at least 1% of range
50	CO Analyser	Ø Non-dispersive Infra-red (NDIR) type with a range of 0 to 1 % CO (v/v)
51		Ø The response time should be less than 20 s
52		Ø Intrinsic error (accuracy) should be at least 1% of range
53		Ø The system must have facilities to record output from the analysers, the thermocouples, the orifice meter, the load cell and the smoke measuring system.

54	Digital Data Collection System	Ø The system should be capable of recording test data at least 1 scan per 1 second or better.
55		Ø Mention the hardware and software (OS) specification of computer system (personal computer/laptop) to be provided by the user.
56	Software	Ø Software for showing the status of the instrument, calibrating the instrument and storage of calibration results, collecting data generated during a test, calculating the required parameters, presenting the results in a manner approved by the standards should be provided on a media.
57	Optional	Kindly mention ability to provide the following optional. For each option please give the technical specifications (drawings if applicable) in the technical quote and extra cost of each individual option in the budgetary quote
58		Ø Additional heated analytical line (3 meter) and filter to enable taking combustion gases for further analysis
59		Ø Step temperature controller (for adjusting conical heater's heat flux in steps)
60		Ø A larger cone, which can be used for larger samples (say 150 mm×150 mm) for low heat release materials
61		Ø A quartz tube of 114 mm I.D. and length 100 mm should be incorporated before gas sampling ring
62		Ø Personal computer i7 8GB 21" 1Tb branded workstation as per the requirement of software for equipment
63		Ø CACC (Controlled Atmosphere Cone Calorimeter) attachment.
64	Warrantee	Ø ACMC (annual comprehensive maintenance cost) for three years after expiration of warranty should be quoted

ELECTRO-SPINNING UNIT

Sl.No.	Despcription	Specification
1	Applications	Preparation of fibers from polymers solution;
2	X, Y and Z- axis stage	Programmed on the operation unit through PC
3	Spnning direction	Vertical, should be controlled for three axis Individually

4	cospinning	Co-spinning option with coaxial fibres
5	Saftey system	Safety door lock system to avoid electrical shock and an exhausting system to evacuate evaporated solvents and flying nanofibers.
6	Power supply control unit	0 - 50kV with emission current less than 10 mA, 50Hz
7		One movable syringe pump.
8	XY Traverse width	10- 300 mm with digital display of transverse speed.
9	Nozzles:	Metallic needles; Single nozzle & multi nozzles with minimum 4 different nozzle diameter(id) ranging from 0.1 mm to 0.4 mm
10	Syringe unit	Four (syringe two for each syringe pump)
11	Syringe pump feed rate	0.1-60 ml/min
12	Syringe Traverse Speed	10-100 mm/min
13	High Voltage Power Supply Device	0-50 KV digital display & voltage control device with compete safety to operator
14	Inner Diameter of Nozzle	100-500 nm
15	Drum Rotation Speed	60-3000 rpm
16	Temperature	Room Temp. to 80 ° C inside stink cupboard
17	Temperature controlling system, precision	±0.1 °C
18	Collector system	i. Plate Collector, (Disc area: A5 size (< 370 cm2) (approx.))
19		ii. Disc Collector, (Disc circumference: 600 mm (approx.),Rotating speed : 500 – 3000 rpm (approx.))
20		iii. Drum Collector (Fiber Deposition area: 870 cm2 (approx.) Rotating speed : 500 – 2500 rpm (approx.))
21	Saftey measures	A door lock and static electricity removal device.
22	**TERMS & CONDITIONS**	
23	1. Tenders should specify and quote all mandatory and other accessories required for installation, commissioning and running the machine.	
24	2. The vendor should supply PCs with requisite specifications and data transfer accessories compatible with the equipment.	
25	3. All necessary CRM along with the calibration certificates wherever required traceable to	
26	**WARRANTY**	
27	4. Minimum 3 years warranty must be provided with additional 3 year's maintenance	
28	5. AMC charges for additional 3 years should be quoted additionally.	
29	**PRE-REQUISITES**	

30	6. 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.	
31	7. The vendor should have technical support in the area of application and service available within the country.	
32	8. The power requirement of UPS for providing a back-up of minimum 01 hour should be	
33	**SERVICE**	
34	9. Appropriate tool box/kit for routine maintenance should be provided with the equipment	
35	10. All documents (i.e. operating & service manuals, drawings etc.) and original softwares relevant to the instrument and its accessories must be supplied.	
36	11. In case of any up gradation of software within the period of warranty then the same	
37	12. Power and receptacle/socket as per Indian Standards should be provided.	
38	13. The vendor shall have local service and application office and infrastructure to attend by	
39	**VENDOR TRACK RECORD**	
40	14. The vendor should furnish details of customers in India.	
41	**TRAINING**	
42	Onsite training for system operation and maintenance as well as application support should	

Stereolithographic Apparatus (SLA)

Sl. No.	Description	Specification
1	Processing Unit	
1.1	Make	Bidder to specify
1.2	Model	Bidder to specify
1.3	Technology	Liquid based additive manufacturing system based on Stereolithography process
1.4	Minimum Build Volume (X. Y, Z)	600 mm x 600 mm x 400 mm or larger with XY axis control
1.5	Resin Vat	Resin VAT with in-built heating module and inter-changeable VAT mechanism
1.6	Process Chamber	Automatic resin level sensor, resin heating and re-coater system with solid platform
1.7	Building Platform	Stainless steel, perforated and reinforced platfoms
1.8	Positioning	Precision positioning on all axis
1.9	Recoating System	Automatic, active recoater blade with volume status monitor and control
		Minimum layer thickness 0.05 to 0.25 mm or better
		Self leveling and self correcting of the resin inside the recoater

1.10	Laser	**one or two** Diode pumped Solid state laser Nd:YVO4 with 355nm wave length or Better/equvalent
		Laser power 3000mW or better/Suitable for the machine
1.12	System Monitor and control Unit	Windows based Industrial Computer system and printer OS
1.13	Scanning Strategy	Should support variable beam (laser facula size of 0.08 mm to 0.8 mm) for fast built with different facula size for contour and infill section to achive better surface quality and faster productivity. The scanning speed should be 6 m/s to 10 m/s or better
1.14	XY Resolution	3800 DPI or 150 µ or better
	Layer resoution	**25 micron**
1.15	Accuracy	0.1 mm for part size of 100 mm or 0.1% of part size excess of 100 mm size **in xy and z axis**
2	Material	
2.1	Material	Must have OEM and authorized materials from suppliers of repute, must have the ability to fabricate parts using rigid & durable (ABS like), Transparent and suitable for investment casting (PC like), durable and other materials (High Temperature, Flexible..) and submit quote separately for each materials as option.
		Machine should have the provision of testing materials developed by the user and professional guidance should be given to adhere to the system compatibility and configuration
		Bidder should also supply proven parameters for all the suitable materials with clear documentation and statistics of the mechanical properties with respect to build orientation and layer thickness.
2.2	Customised material guidence	Machine should have the provision of testing materials developed by the user and professional guidance should be given to adhere to the system compatibility and configuration
2.3	Data sheet (MDS)	MSDS or material data sheet must be submitted for materials to be submitted
3	Software	
3.1	System control Software	Capable for 3D view, manage and printing of Jobs and must have OEM partnership with the software company for future support and upgrades. OEM ceritifcate must be submitted along with the supporting document

3.2	Part Preparation and machine control Software	Complete module for conversion of part data in the STL format and optimization of layer data.
3.3	Parameter editor	The Printer software must support an open architecture to allow modification and other process parameters for all quoted or future materials.
3.4	License	License must be perpetual
4	**Essential Accessories**	
4.1	Curing Chamber	Bidder should specify and quote suitable post curing chamber
4.2	Interchangeable Material tray	Bidder should specify and quote additional resin VAT with lifting system with required accessories
4.3	Sand Blaster	Bidder should specify and quote
4.4	Support removal	Bidder should specify and include accessories/ tools for manual support removal of parts and cleaning
4.5	De-humidifier	Vendor should supply suitable de-humidifier to maintain room humidity level within suitable range for machine operation.
4.6	Online UPS	Vendor should supplyBranded UPS with minimum 60 minutes power backup **suitable** for the machine and essential accessories. Should have built in safety to protect machine from voltage spikes and sudden surges.
4.7	Workstation with accessories	Bidder should supply suitable latest model workstation with complete accessories for handling lagre size stl data (Xeon Silver 4108 Processor or higher, Win 10 Pro, RAM: 128GB DDR4, NVIDIA Quadro P1000 4GB, 5 TB Hard Drive, Monitor, Keyboard, min. 3 Years Warranty)
4.8	Compressor	**Branded compressor suitable for SLA**
4.9	Tool kit	Vendor should supply standard tool kit for startup, removal of parts and cleaning (list to be attached).
4.9	Design, Analysis & Optimisation software (Research Version & License must be perpetual) - **Bidder must quote AMC cost separately for each items**	**Solid Works - Design complete module** **Materialise software for additive manufacturing - SLS Slice & Sinter module, Simulation module, e-Stage modules- Polymer & Metal, Inspector, 3matic modules - Design, Latice, Remesh, Texturing, CAD Link.**
4.1	Any other accessories required	Vendor should supply all the other accessories, material transport trolleys / carts and spares required for effective and better utilization of machine. All the required accessories should be listed **and quoted separately**
6	Other essential requirements	

6.1	Safety	The machine and all the accessories supplied to meet objective should be able to operate without any risk or hazard, without any additional protection, provision, training or guarding devices and meet current international standards. Operations of machine should be in closed chamber with necessary safety measures. Chamber door must auto lock during part building.
6.2	Other Conditions	The bidder must have supplied at least 10 such machines of similar capacities with in India including OEM Installations in the past. A satisfactory performance certificate from those users may be solicited if needed. Bidder should submit complete contact details.
		Manufacturer of the supplied equipment must be ISO/ CE/FDA approved
		Bidder must submit Authorization letter form OEM of Printer, materials and software
6.3	Scope of supply	Bidder should submit complete scope of supply (Machine, standard acessories, Optional Acessories etc with make model) in the technical bid. Bidder should supply complete start up package including material necessary to prove the machine and provide training.
7	Installation, Commissioning and Training	
7.1	Installation and commissioning requirements	Bidder should state the space required and condition of floor and any other requirements for installation of the machine and equipments. State clearly the specifications of electical requirement. Vendor should carry out installation and commissioning of the machine and its accessories on a turnkey basis.
7.2	Training and documentation	Minimum of 5 days training for five persons which includes basic & advanced level training. Training content and plan to be submitted. Training faculty must have adequate experience in this field.
		The vendor should supply the necessary manuals such as
		· Software instruction
		· Maintenance and trouble manual
		· Training
		· Installation and Commissioning
		· Handling of accessories
		· Software key (if any)

7.3	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 24 hours of need. Technical support personnel must have adequate experience in this field. Technical support personnel details should be submitted. Name and address of the authorized service centre/ partner in India along with the certificate of authorization should be attached.
7.4	Annual Comprehensive Maintenance Contract (ACMC)	Vendor should quote for Annual Comprehensive Maintenance Contract **separately** for the whole system and accessories supplied after the completion of performance warranty period. Supplier has to provide service support within 24 hours. Calibration of the machine shall be a part of warranty and ACMC. It shall also be mandatory to perform calibration after every major repair or breakdown.

Micro Moulding Machine

High Precision all electric Injection Moulding Machine with Microprocessor Controlled and capable of compression injection moulding with the following specification for research and development purpose.

TECHNICAL SPECIFICATIONS:

Sl. No.	Description	Specification
1	Drive System	All electric
2	**Clamping Unit**	
2.1	Max. Clamping force (KN)	800 – 1000
2.2	Opening Stroke (mm)	350-450
2.3	Minium Mould Installation Height (mm)	200 mm or better
2.4	Mould mounting platen (mm)	600-650 x 600-650 or better
2.5	Max. Ejector Force(KN)/Stroke (mm)	25/100 or better
3	**Injection Unit**	
3.1	Screw Diameter (mm)	30 - 40
3.2	Screw Stroke (mm)	140 or better
3.3	Max. Short Weight (g)	100 or Higher
3.4	Max. Injection Pressure (bar)	2000 or better (Multi stage)
3.4	Max. holding Pressure (bar)	1800 or better
3.6	Max. Injection Flow (cm^3/s)	200-350
3.7	Max. Screw speed (RPM)	400-450 (multistage)
3.8	Max. Screw Torque (Nm)	300-450
3.9	Barrel material	Bi-Metal (Nical based with tungstion reinforcement) or equvalent

3.10	Screw Material	Through hardened powder metallurgical steel
3.11	Heating capacity & Zones (kW)	9/4 or better
4	Max. Drive Power (kW)	14 or better
5	Injection -Compression	Complete capability for injection – compression molding (Coining)
6	Controller and software	Latest version of Microprocessor controller with software
7	Essential Accessories	Bidder to specify and quote the suitable accessories essential for effective utilization of machine such as
		· Chiller Unit (Cooling capacity 6 kW or more, teperature range + 5 to 20 degree)
		· Stabiliser
		· MTC unit for water (Max. Temp 140°C, Pressure 4 bar and flow 40 liter/ min) with high temperature hoses from controller to machine platernts
		· MTC unit for oil (Max. Temp 160°C , Pressure 4 bar and flow 60 liter/ min) with high temperature hoses from controller to machine platernts
		· NRV set
		· Thermocouples (for Nozzle & barrel)
		· Heaters
		· Nozzle for Nylon/LCP
		· Multipoint ejector rod
		· Limit switches
8	Other accessories/parts	Bidder to specify and quote the optional accessories available for effective and better utilization of machine and research purpose.
		· Water inlet / out let manifold for mould cooling (Standard)
		· Interface for gas assisted injection moulding and Gas Assisted Injection molding system with complete acessories
		· Hot Runner control (Minimum 8 Zone system with necessary acessories)
		· Hot pneumatic squential gates (Minimum 4 Nos.)
		· Core Pulling system - Minimum 2 Nos
		· High execution to increase injection speed
		· Hopper drier with vacuum loader etc.

9	Installation &Training	Basic & Advanced level training and providing two sets of operating & maintenance manuals and other reference manuals for getting quality output and longer trouble free life of machine.
		Basic & Advanced level training schedule and plan to be submitted.
10	Manufacturer's credential	Should have sizable installations of same model worldwide and at least two same or similar model in India.
11	References	Tenderer shall give complete contact details of existing customers having such supply in India.
12	Safety requirements	The machine or set of machines supplied to meet objective shall be able to operate without any risk or hazard without any additional protection, provision, training or guarding devices and meet current international standard.
13	Availability of spares and consumables with price list	Tender shall include list of all essential spares and consumables to be provided with replacement time prescribed for each such item and its availability within reasonable time period. In case if any such item is likely to be out of availability within service period of machine, such item shall be included in initial supply. Price list of each material with minimum quantity, build plates, spares and consumables are to be quoted.
		Price list of each material with minimum quantity, build plates, spares and consumables are to be quoted.
14	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.
15	Annual Comprehensive Maintenance Contract (ACMC)	Tenderer shall quote for Annual Comprehensive Maintenance Contract **separately** for the whole system after the completion of Performance Warranty period. Supplier has to provide service support within 48 Hours.
16	Scope of supply	Tenderer should supply complete start up package necessary to prove the machine and provide training. List for scope of supply to be submitted.

Multi Jet Fusion

Sl. No.	Description	Specification
1	Make	Bidder to specify
2	Model	Bidder to specify
3	Technology	An open architecture 3-D Polymer Additive Manufacturing System based on non-laser Material Fusion Technology having capability to transform part properties voxel by voxel.
4	Applications	The Machine will be used for Direct production of concept models, functional prototypes, strong mechanical parts for end use applications, patterns for sand casting etc.,
		The machine should be able to process verities of engineering polymers to enable rigid and flexible parts to be produced.
		Printed part should be isotropic & watertight having density at least 99 % or better.
5	**Processing Unit**	
5.1	Building volume	Minimum built volume 350 mm x 280 mm x 350 mm (bigger build volume is preferred).
5.2	Layer thickness	0.08 – 0.1 mm or better
5.3	Build speed	5000 cm^3/hr or better
5.4	Accuracy	0.2 mm/100mm or better
5.5	Min wall thickness / scanning line	0.4mm or Better
5.6	Resolution	1200 dpi or better
5.7	Machine Control	Advanced latest control system for effective control and printing
5.8	Thermal Control and Real time temperature Monitor & correction System.	To monitor the build temperatures throughout the build volume and calibrate automatically after each build layer. The mechanism employed to achieve this need to be explained in detail in the bid.
5.9	Effective Part Manufacturing Criteria	Supplied system should have fully Automated Mixing, Sieving, and Loading; with fast cooling option of Build Unit as a separate unit and the printing unit should be free from any material handling.
		Additional Material processing unit with fast cooling option & build unit for handling different material & enhanced productivity should be quoted separately.
5.10	Powder Recycling and Handling	Fully automatic system, Processing Station with Fast Cooling of Build unit to be provided.
5.11	Filter System	The system should have a filter which can remove both big and fine condensates. The life of each filter to be defined by the manufacture.

5.12	Parameter set module	Supplier should supply proven parameters for the above materials with clear documentation and statistics of the mechanical properties as build and under heat treatment conditions.
5.13	Parameter Editor Module	Complete package of process Parameter Editor to optimize parts results.
		Vendor to confirm that all parameters that are required to build a part is user controllable, and if not, to list what is not accessible.
		Also vendor should provide training on build Parameter Editing. The syllabus of this training should be clearly defined so that the user knows what is being offered.
6	**Material**	
6.1	Material options	Wide variety of material option and capable to use all type of materials such as Nylon 11, Nylon 12, glass filled Nylon, TPU and new materials.
		The material should be UL 94 certified for flammability & suitable for use in electrical/ electronic end use products
		Parts made of the material should be IP 67 certified, suitable to print enclosures for outdoor usage.
6.2	Powder material	Supply minimum 250kgs of each material with agents
7	**Software**	
7.1	Process Software	To control the building process and ergonomic operating interface of the touch screen.
		The process software should be able to work closely with the internal production and generate statistical QA reports which are preferred to subjective method of reporting.
7.2	Slicing and data editing software	Complete module for conversion of part data in the STL format and optimization of layer data.
7.3	Software feature	The machine should have feature of adding the parts in the running build job without interrupting the build.
7.4	Process control desktop software	To prepare build job independent from the machine processor.
7.5	Control and reporting software	Suitable software for controlling and reporting RP system.
		The system should also automatically generate the following for documentation
		General information of the build job
		Illustration of part placement on the build platform
		Process information of parameters and time
		Sensor data for temperature, pressure

8	**Essential Accessories**	
8.1	Workstation with accessories	Suitable OEM computer system handling large size stl data with complete accessories for slicing and control building process.
8.2	Vacuum Cleaner	Suitable Vacuum Cleaner - Bidder to specify and quote.
8.3	Micro shot peening	Suitable Micro shot peening smooth surface finish - Bidder to specify and quote.
8.4	Online UPS	Suitable UPS with minimum 60 minutes backup power for the machine. - Bidder to specify and quote.
8.5	De-humidifier	As per the requirement, Bidder to specify and quote.
8.6	Compressor with dryer (Silent operation)	As per the requirement, Bidder to specify with details and quote.
8.7	Electrical Lifting and handling truck	Suitable system if necessary for the machine - Bidder to specify and quote.
8.8	Break out Tool Kit	Standard tools/kits for startup, removal of parts and cleaning (list to be attached).
8.9	Maintenance Kit	Required spares like filters, rubber blade, lamps, gloves, Mask, Safety Goggles etc. should be supplied
8.10	Post-processing unit	Bidder to specify sutable dye finishing unit
9	**Optional accessories**	Bidder to specify and quote
9.1	**Materialise Software**	**Bidder to specify and quote suitable and available all modules of Materialise software for this 3D printer.**
10	**Any other accessories if available/required**	Necessary/Optional accessories and spares, if required for running the machine smoothly, bidder to specify with details and quote.
11	**Other essential requirements**	
11.1	Safety	The machine and all the accessories supplied to meet objective should be able to operate without any risk or hazard, without any additional protection, provision, training or guarding devices and meet current international standards. Operations of machine should be in closed chamber with necessary safety measures. Chamber door must auto lock during part building.
11.2	Other Conditions	The bidder must have supplied at least 3 such machines of similar capacities with in India including OEM Installations in the past 3-4 years. A satisfactory performance certificate from those users may be solicited if needed. Bidder should submit complete contact details.
		Manufacturer of the supplied equipment must be ISO/ CE/FDA approved
		Bidder must submit Authorization letter form OEM of Printer, materials and software

11.3	Scope of supply	Bidder should submit complete scope of supply (Machine, standard acessories, Optional Acessories etc with make model) in the technical bid. Bidder should supply complete start up package including material necessary to prove the machine and provide training.
12	**Installation, Commissioning and Training**	
12.1	Installation and commissioning requirements	Bidder should state the space required and condition of floor and any other requirements for installation of the machine and equipments. State clearly the specifications of electical requirement. Vendor should carry out installation and commissioning of the machine and its accessories on a turnkey basis.
12.2	Training and documentation	Minimum of 5 days training for five persons which includes basic & advanced level training. Training content and plan to be submitted. Training faculty must have adequate experience in this field.
		The vendor should supply the necessary manuals such as
		· Software instruction
		· Maintenance and trouble manual
		· Training
		· Installation and Commissioning
		· Handling of accessories
		· Software key (if any)
12.4	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 24 hours of need. Technical support personnel must have adequate experience in this field. Technical support personnel details should be submitted. Name and address of the authorized service centre/ partner in India along with the certificate of authorization should be attached.
12.5	Annual Comprehensive Maintenance Contract (ACMC)	Vendor should quote for Annual Comprehensive Maintenance Contract **separately** for the whole system and accessories supplied after the completion of performance warranty period. Supplier has to provide service support within 24 hours. Calibration of the machine shall be a part of warranty and ACMC. It shall also be mandatory to perform calibration after every major repair or breakdown.