

Technical Specification for Tender No. 2023-24/04 Released Government E - Marketing (GeM Portal)

1. UTM (10kN)

Sl. No.	Specification	Range / Value
1	Max. load capacity	10 kN
2	Load cell	10 kN, 1.0 kN and 100 N
3	Load cell accuracy	≤ 0.5 % or better
4	Test speed	0.1 mm/min to 500 mm/min.
5	Speed accuracy	± 0.2% or better
6	Cross head travel	Min 800 mm or better
7	Horizontal daylight	Min 400 mm or better
8	Strain measurement accuracy	0.5% or better
9	Load measured	Tension, bending and Compression
10	Grips & Fixtures	All the Fixtures such as Tensile grips, mechanical wedge grips, roller grips, pneumatic vice grips should suitable for low and high temperature testing and can be accommodated into environmental chamber.
		Suitable Pneumatic grip for plastics samples (test specimen-filament, films and fibre)
		· Tensile ASTM D638, ASTM D 882, ASTM D 412, ISO 527- Suitable for Flat Sample thickness 1mm to 20mm
		· Tensile Grip IS 1969 for woven sacks (50 mm width)
		Manual Wedge grip up to 10KN

10.1	Grips & Fixtures for 10KN Load Cell	<ul style="list-style-type: none"> · Tensile ASTM D638, ASTM D 3039, ISO 527- Suitable for Flat Sample thickness 1mm to 20mm <hr/> <ul style="list-style-type: none"> · Compression test fixture complying to ASTM D 695 <hr/> <ul style="list-style-type: none"> · Flexural - three point bend and four point test fixture complying to ASTM D 790, ISO 178 with adjustable span 10 mm -300 mm or equivalent. Interchangeable option for anvils, rollers and supports <hr/> <ul style="list-style-type: none"> · Fixtures for 180° peel as per ASTM D 3330 Fixture for shear as per ASTM D 732 <hr/> <ul style="list-style-type: none"> · Roller grips for Belt ASTM D 3950
10.2	Grips & Fixtures for 1KN Load Cell	<p>Pneumatic grip (for Flim, rubber, fibre/filament)</p> <hr/> <ul style="list-style-type: none"> · Tensile ASTM D882- Suitable for Flat Sample thickness 10 micron to 5 mm and Width 25 mm <hr/> <p>Manual Wedge grip</p> <hr/> <ul style="list-style-type: none"> · Tensile testing of Yarns and Threads (confirms to ASTM D 2256) MPCF type grips <hr/> <ul style="list-style-type: none"> · Tensile ASTM D882- Suitable for Flat Sample thickness 10 micron to 5 mm and Width 25 mm <hr/> <ul style="list-style-type: none"> · Flexural - three point bending and four point bending fixtures complying to ASTM D 790 with adjustable span 10 mm -300 mm or equivalent. Interchangeable option for anvils, rollers and supports <hr/> <ul style="list-style-type: none"> · Short beam test fixture as per ASTM D 2344 <hr/> <ul style="list-style-type: none"> · Fixtures for 180° peel as per ASTM D 3330
10.3	Grips & Fixtures for 100N Load Cell	<ul style="list-style-type: none"> · Pneumatic grip (for Flim,rubber, fibre/filament) <hr/> <ul style="list-style-type: none"> · Tensile testing of Yarns and Threads (confirms to ASTM D 2256) MPCF type grips

		· Tensile ASTM D882- Suitable for Flat Sample thickness 10 micron to 5 mm and Width 25 mm
11	Extensometer	Laser / Any other non-contact method
		Capable for use under ambient conditions as well as elevated and sub-zero temperature inside environmental chamber
		Vertical travel - 600 mm or better
		Resolution - 0.02 mm or better
		Accuracy - 1% on 25 mm & 50 mm gauge length
		Contact extensometer suitable for measuring elongation, young's modulus and poisson's ratio (provision for keeping the extensometer within the machine when not in use)
12	Environmental Chamber	
	Operation Temperature range	-70 to +300 °C or better
	Accuracy	0.5°C cover the entire range
	Ramp Rate	10°C/min or better
	Chamber Dimension	Suitable for elastomeric samples
	Cooling Medium	Liquid Nitrogen (Dewar Flask of 25 to 50 L capacity to be provided with required accessories)
13	Operating system & Software	Suitable for all functions such as maximum load, strain, modulus etc. Necessary software, Computer & Printer should be provided.
14	Installation and Commissioning	· The Machines should come with all other essential accessories & spares (as per ASTM & ISO standards) required for installation, commissioning & operation.

15	Scope of supply	Complete list of items quoted are to be provided
16	Training	Training on operation & maintenance of the equipment should be provided onsite

2. Spectrofluorometer		
Sl. No.	Specification	Range / Value
1	Applications:	· Supports application in wide variety of field like food, life science, environment, pharmaceuticals, electricals/electronics and chemicals.
		· The spectrometer should capable of measuring the fluorescence of a molecule to gather information about its components and chemical environment.
3	Light source:	150 W Xenon lamp (Light source lifetime: Atleast 2000 hours or above)
4	Monochromator:	Holographic grating
5	Wavelength scale:	200 to 900 nm and 0 order
6	Scanning Wavelength range:	200 to 900 nm and 0 order
7	Spectral bandwidth:	Excitation: 1.5, 3, 5, 10, 15, 20 nm
		Emission: 1, 3, 5, 10, 15, 20 nm
8	Resolution:	1.0 nm or less (Emission)
9	Wavelength accuracy:	±1.0 nm

10	Detector:	PMT or equivalent (should scan wavelength range to 900 nm)
11	Sensitivity:	Spectral bandwidth 5 nm or better Response 2 sec. or better
12	Wavelength scanning:	must achieve atleast 50,000 nm/min
13	Wavelength slewing speed:	Must have atleast 50,000 nm/min.
14	Interface:	USB 2.0/3.0 Interface for Auto Sample Changer
		Interface for sipper unit
		Analog output (1 V/full scale)
		Interface to input External switching signal
15	Data processing unit	Suitable PC with 12 th generation i7 processor, 16 Gb RAM, DVD - RW, 500 Gb SATA HDD, latest Windows operating system with professional (validity: lifelong), 27 " LCD display, Wifi enabled
16	Printer	Laser Colour Printer compatible with Windows 10
17	Dimensions/weight	Table top
18	Utility	AC 220, 240 V 50/60 Hz
20	Working temperature	15 to 40 °C with no condensation

21	Warranty	02 years
22	Pre-Installation Requirements	Bidders needs to provide pre-installation requirement.
23	Accessories to be quoted and supplied along with machine equipment	Fluorescence cell of 10 mm pathlength - 1 pair to measure liquid samples
		Cutoff filters- 1 set (Cutoff filters required to block excitation light and scattered light .
		Solid (Powder) Sample Holder- Qty 1 (To measure solid and powder samples)
24	Installation and Commissioning	· The Machines should come with all other essential accessories & spares required for installation, commissioning & operation.
25	Scope of supply	Complete list of items quoted are to be provided
26	Training	Training on operation & maintainance of the equipment should be provided onsite

3. Electro-Spinning Unit

Sl. No.	Specification	Range / Value
1	Applications	Preparation of fibers from polymers solution; fabrication of nanofiber mats, fabrics, nanofilters and nanoscaffolds; should be capable of direct coating on substrates, like glass, fabric, etc.
2	X, Y and Z- axis stage	Programmed on the operation unit through PC/mounted panel control
3	Spnning direction	Vertical, should be controlled for three axis Individually; the spinning chamber should have humidity display, temperature control, inert gas purging facility and exhaust.
4	cospinning	Co-spinning option with coaxial fibres

5	Safety system	Safety door lock system to avoid electrical shock and an exhausting system to evacuate evaporated solvents and flying nanofibers.
8	Power supply control unit	0 - 30kV or better with emission current less than 10 mA, 50Hz; should have digital display for current and voltage monitoring.
9	Syringe pump	One movable syringe pump.
10	XY Traverse width	10- 300 mm with digital display of transverse speed.
11	Nozzles	Metallic needles; Single nozzle, multi nozzles, core-shell nozzle and co-axial nozzle; with minimum 4 different nozzle diameter. IDs to be specified by the bidder
12	Syringe unit	Four (syringe two for each syringe pump); capacity: 1, 5, 10, 20, 30 and 50 mL; should be fitted with a heater to heat up to 80 °C
13	Syringe pump feed rate	0.1-60 ml/min
14	Syringe Traverse Speed	10-100 mm/min
15	High Voltage Power Supply Device	0-50 KV (or better) digital display & voltage control device with complete safety to operator
16	Fiber Diameter	Should be capable of producing fibers of diameters 20 nm to 1 µm (inclusive of both)
17	Inner Diameter of Nozzle	100-500 nm
18	Drum Rotation Speed	60-3000 rpm
19	Temperature	Room Temp. to 45 ° C (or better) inside stink cupboard
20	Temperature controlling system, precision	±0.1 °C
		i. Plate Collector, (Disc area: A5 size (< 370 cm ²) (approx.))

21	Collector system	ii. Disc Collector, (Disc circumference: 600 mm (approx.), Rotating speed : 500 – 3000 rpm (approx.))
		iii. Drum Collector (Fiber Deposition area: to be specified by bidder, Rotating speed : 500 – 2500 rpm (approx.))
22	Safety measures	A door lock and static electricity removal device; protection from overload and sparking between electrodes; solvent-resistant PTFE tubing with solvent-resistant connector should be provided.

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.

WARRANTY

4. Minimum 2 years warranty must be provided with additional 3 year's maintenance contract (Optional) in order to keep the equipment in continuous working condition. Part numbers of all parts for which warranty will not be applicable should be specified in the quotation.

5. AMC charges for additional 3 years should be quoted additionally.

PRE-REQUISITES

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.

7. The vendor should have technical support in the area of application and service available within the country.

8. The power requirement of UPS for providing a back-up of minimum 01 hour should be specified.

SERVICE

9. Appropriate tool box/kit for routine maintenance should be provided with the equipment

10. All documents (i.e. operating & service manuals, drawings etc.) and original softwares relevant to the instrument and its accessories must be supplied.

11. 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.

12. Power and receptacle/socket as per Indian Standards should be provided.

13. The vendor shall have local service and application office and infrastructure to attend by visit within 48 hours of need.

VENDOR TRACK RECORD

14. The vendor should furnish details of customers in India.

TRAINING

15. Onsite training for system operation and maintenance as well as application support should be provided by the vendor at its own cost.

SCOPE OF SUPPLY

16. Complete list of items quoted are to be provided

Installation and Commissioning

17. The Machines should come with all other essential accessories & spares required for installation, commissioning & operation.

4. Rotary Evaporator system with chiller and vacuum pump

Sl. No.	Specification	Range / Value
1	Driving Unit	Encased induction motor with electronic speed control
2	Condenser	Vertical condenser with double spiral glass coil for all standard distillations
3	Drive Unit	Motorized D
4	Jack up Function	Electronic quick action jack and automatic lifting of the flasks during a power failure
5	Rotation Speed	up to 280 rpm or better with microprocessor control.
6	Display	digital display of rotation speed and heating bath.
7	Speed display	Digital
8	Sample Flask	1L, Pear Style
9	Receiving flask	250mL, 500mL, 1L, round style with ball joint
10	Evaporating flask	50-5000 mL (should be fit on the same joint adapter without additional joint)
11	Vacuum seal	PTFE seal (seal should also be covered in standard warranty period of two year)
12	Liquid Contact parts	Glass & PTFE
		· Maximum Temp. range: upto 220 °C
		· Heating adjusted horizontally up to 200 mm
		· should offer efficient space to accommodate evaporating flasks from 50 mL to 5000 mL

13	Heating bath	<ul style="list-style-type: none"> · should have non-slip safety handles for safe and easy transport of bath
		<ul style="list-style-type: none"> · Should have over heat cut-off protection at 220 °C
		<ul style="list-style-type: none"> · Construction: Insulated double wall for user protection against burns and scalding
		<ul style="list-style-type: none"> · Material of construction of heating bath: ASIS 316 L (L = Electro-polished)
		<ul style="list-style-type: none"> · Volume of Heating Bath: 4.5 Ltrs
14	vacuum pump	
14a	Pump	Two-Stage diaphragm pump made from chemically resistant materials
14b	High Suction capacity	1.5 m ³ /h or better
14c	vacuum pump pressure	ultimate vacuum of 7 mbar or better
15	Chiller	
15a	Types	Benchtop
15b	Temperature range	-20 °C to ambient
15c	Temperature control accuracy	± 0.5 °C
15d	Flow rate:	more than 5 l/min
15e	Alarm and Indicators	Low flow shut off and high/low temperature alarms along with fluid level indicator
15f	Display	Digital

16	Warranty	02 years
17	Installation and Commissioning	The Machines should come with all other essential accessories & spares required for installation, commissioning & operation.
18	Scope of supply	Complete list of items quoted are to be provided
18	Training	Training on operation & maintenance of the equipment should be provided onsite

5. CO2 Incubator		
Sl. No.	Specification	Range / Value
1	Applications:	Should provide maximum culturing space and the ideal environment for basic cell culture incubation
2	Type	Microprocessor controlled Dual 180 L Stack CO ₂ incubator
3	Temp. control accuracy	±0.1°C with high temp. Decontamination at 120 °C
4	Filter Type	HEPA
5	Certifications/Compliance	It should be ISO 9001 & CE Certification
7	Chamber Material	Copper
8	Temperature Range	4 °C above ambient to 50 °C
9	Temp. Uniformity	It should have six-sided direct heating with fanless, gentle convection circulation to provide stable temperature control, excellent uniformity and rapid recovery with no over shoot.

10	CO ₂ control range	It should have CO ₂ control range from 0.2 to 20% with control accuracy and uniformity of $\pm 0.1\%$ and should have rapid recovery of at least 0.7% per minutes.
11	CO ₂ Sensor	It should have Infra-red (IR) CO ₂ sensor
12	Shelves	It should come with minimum 4 adjustable height shelves
13	CO ₂ Concentration Range	upto 20%
14	Humidity Source	Covered integrated water reservoir to achieve at least 95% RH.
15	Data Outputs	USB
16	Warranty	02 years
17	Installation and Commissioning	The Machines should come with all other essential accessories & spares required for installation, commissioning & operation.
18	Scope of supply	Complete list of items quoted are to be provided
19	Training	Training on operation & maintainance of the equipment should be provided onsite

6. Aerobic Biodegradation Tester

Sl. No.	Specification	Range / Value
1	Type of incubation chamber	A. Triple walled chamber - Inner made of stainless steel sheet and outer made of mild steel sheets with powder coat finishing. Inter space in between the walls is highly insulated with glass wool to minimize radiation heat loss.
		Double walled door with perfect insulation, mounted on heavy duty hinges should be provided with locking arrangements. (Top opening).
		B. Evaporating Copper coils should be kept inside the inner chamber for faster cooling. The refrigeration system consisting of branded compressor, air – cooled condenser and accessories has to be provided at the top portion of the Incubator.
2	Temperature Range	5 °C to 70 °C or better
3	Temperature Resolution	0.1 °C or better
4	Inner chamber size	suitable for 24 Nos composting vessel or more
5	Controller Type	PID controller
6	Heating Element	Nichrome type heating element
7	Temperature display	LED Display
8	Temperature Accuracy	± 0.5 °C or better
9	Temperature Uniformity	± 1 °C or better

10	Refrigeration System	CFC free refrigeration system with eco-friendly refrigerant
11	Calcium hydroxide filter column	minimum 2 Nos or more
12	calibration certificate	Traceability certificate should be provided from national and international accredited body for temp controller and air flow meter
13	Flow meter for Bio degradation	48 nos or more
14	Composting Vessel of 3 ltr. with air tight fitting.(rubber gasket)	24 Nos or more
15	Cylindrical shape SS mesh type filter	24 Nos or more
16	Multi Storage Rack with Castor wheels	minimum 2 Nos or more
17	CO ₂ trapping Glass vessel (3L Capacity, Cork, Glass tube)	72 Nos or more
18	Silicon tube	600 Mtrs or more
19	Standards	Confirms to ISO 14855 part-I, ASTM D 5338, ISO 17556, ASTM D 5988, ASTM D 6868
20	Installation and Commissioning	The Machines should come with all other essential accessories & spares required for installation, commissioning & operation.
21	Scope of supply	Complete list of items quoted are to be provided
22	Training	Training on operation & maintainance of the equipment should be provided onsite

7. Anaerobic Biodegradation Apparatus

Sl. No.	Specification	Range / Value
1	Conforming to standards	IS/ISO 15985, IS/ISO 14853, ASTM D 5511
2	Incubator or Waterbath	Maximum temperature: Upto 70°C
		Accuracy: ± 1°C
		Capable of maintaining 52±2°C
		Capable of accommodating 24 nos. of Digestion vessels
3	Digestion Vessel	Conical or other suitable glass flasks – No loss of gas should occur
		Volume: Min. 750 mL – Min. 12 Nos. each
		The Digestion Vessel should be equipped with in-situ gas absorption attachment (GAA) units placed above the headspace of the reactor.
4	Gas Volume measurement System	· An inverted graduated cylinder or plastic column in water or another suitable device for measuring gas volume
		· The gas volume measuring device, as well as the gas tubing, shall be of sufficient quality to prevent gas migration and diffusion between the system and the surrounding air
5	Gas Analyzer	· Equipped with suitable detector for measuring the methane and oxygen / Air demand/consumed concentration in the evolved gases
		· Required Oxygen / Air storage bags / Cylinders

6	Connecting tubes	Suitable for leak proof connection between Digestion vessel and gas measuring system
7	Gas removal Unit	Ex situ Gas trap bottles – Min. 12 Nos.
		In situ Gas trap attachment units Min. 12 Nos.
		Capacity: 100 mL
8	Flow Meter Array Unit	For min. 12 Vessels
		Range: 5 to 100 mL/min
		Measurement Resolution: Atleast 10 mL or better
		Data Storage: Locally. Storage up to 50 L of gas per Flow Meter at once or better
9	Stirrer	Motor-driven agitators Min. 12 Nos. each for both Ex situ & In situ Digestion Vessel units.
10	Software	User friendly software for complete measurement and data storage
		Gas flow analysis
		Volumetric measurement of oxygen / Air demand/consumed and Methane gases.
		Time to time updation in software, if any should be upgraded.
11	Computer	Computer with suitable configuration with printer should be provided.
12	Accessories	Any other accessories required for smooth operation of the equipment should be quoted

13	Warranty	Minimum two years of warranty
14	Training	Training should be provided onsite for atleast 05 members
15	Manual	User Manual Guide – Both hard and soft copy to be provided.
16	Service	Service person should be made available within 48 hrs of complaint.
17	Installation and Commissioning	The Machines should come with all other essential accessories & spares required for installation, commissioning & operation.
18	Scope of supply	Complete list of items quoted are to be provided

8. Liquid Nitrogen Plant (10 litre / day)

Sl. No.	Specification	Range / Value
1	Production Rate	10 liter/day or better at 23 °C
2	Purity	≥99%
3	Flow Rate	≥ 0.5 m ³ /hour or better
4	Dewar Volume	50 liter or higher
5	Dewar Level Control	Capacitive level sensor or equivalent
6	Dew Point	< -60 °C
7	Operating Pressure	1.5 bar

8	Controller	Color Graphic Touch Screen
9	Temperature Range	+5°C to +40°C
10	Nitrogen Generator	Build-in nitrogen generator should be provided
11	Compressor	Built-in air compressor should be provided
12	Noise Level	<65 dB@ 1 meter
13	Compressor	He, 99.995% purity @ 15 bar (220psi)
14	Cryocooler	GM type cryocooler mounted on Dewar
15	Installation and Commissioning	The Machines should come with all other essential accessories & spares required for installation, commissioning & operation.
16	Scope of supply	Complete list of items quoted are to be provided
17	Training	Training on operation & maintenance of the equipment should be provided onsite

9. Nitrogen Generator (Purity99.99%)

Sl. No.	Specification	Range / Value
1	Applications	GC-FID, GC-MS, LC-MS-MS, ICP / NMR/ FTIR / IR and all Analytical Instruments
2	Capacity	20 LPM at 6 Bar
3	Operation	Air dryer timer based
4	Purity	99.99%

5	Storage Tank	250 liters or more
6	Compressor	7.5 hp Oil free air compressor or better
7	Capacity (PD)	20 cfm or higher, 8.5 kg/cm ² , 7.5hp,
		440 VAC, 3 Phase
8	Working pressure	15 kg/cm ² or better
9	Controllers	Safety valve, pressure switch, drain valve, pressure gauge, non-return valve, needle valve, solenoid valve
10	Moisture	< 5 ppm
11	Oxygen	< 5 ppm
12	Total Hydrocarbon	< 0.5 ppm
13	Micron particulates	0.01 μ or better
14	CO & CO ₂	< 2ppm
15	Method of purity	Pressure Swing Adsorption (PSA)
16	Temperature	5 °C to 25°C
17	Flow rate	30 L/min or better
18	Safety Controller	Safety system with alarms

19	Warranty	2 years
20	Installation and Commissioning	The Machines should come with all other essential accessories & spares required for installation, commissioning & operation.
21	Scope of supply	Complete list of items quoted are to be provided
22	Training	Training on operation & maintenance of the equipment should be provided onsite

10. Smoke Density Chamber, Smoke Toxicity & Single Flame Source

Sl. No.	Specification	Range / Value
1	Application	The Smoke Density Chamber should be capable to determine smoke generated by solid materials, measures the specific optical density of smoke generated by materials when an essentially flat specimen up to 25 mm thick, is exposed vertically to a radiant heat source of 25kW/m ² , in a closed chamber, with or without the use of a pilot flame. In addition to that, it measures the toxicity of the produced smoke.
2	Applicable Standard	ISO 5659-2 – Smoke Density; ISO-17084- Smoke Toxicity ISO 11925-2 - Single Flame Source Specified as per EN 45545-2 standard
3	SMOKE DENSITY TEST CHAMBER	
3.1	Radiator:-	
	Rated Power	2600 W
	Heat flux	10 kW/m ² to 50 kW/m ²
	Measuring position	25 mm under specimen.

	Measurement area of the radiator	Φ10 mm
	Distance from the furnace	25 mm
3.2	Burnner:-	
	Flame Height	30 ± 5 mm
	Distance to the Specimen	10 mm
3.3	Specimen:-	
	Size	59 mm x 59 mm
	Thickness	Less than 25mm
	Orientation	Horizontal
4	SMOKE TOXICITY TEST CHAMBER	
4.1	Smoke Toxicity attachment	Gaseous/volatile test products drawn from the chamber at any time for analysis through three ports on the top of the chamber. One of these ports is used to connect to the vacuum box.
5	SINGLE FLAME SOURCE TESTER	
5.1	Power	AC220V±10%,50Hz
5.2	Burning Chamber :-	
	Burner Dimension	0.17mm with four ∅ 4mm suction inlet
	Gas pressure	Should have capacity to control gas pressure up to 10 kPa~50 kPa

	Flue air velocity	0.7m/s
	Burner angle	45°
5.3	Control Device:-	
	Timer for flame	0~ 99min 99sec
	Timer accuracy	≤1s/h
	Anemometer accuracy	±0.1m/s
	Orientation	Horizontal
5.4	Test procedure:-	
	Specimen process	23±2 °C, 50% to constant weight
	Modes	25 kW/m ² without fire
		25 kW/m ² with fire
		50 kW/m ² without fire
		50 kW/m ² with fire
Time	10 min or minimum light transmittance value	
	<p>Test chamber should have with full width opening door, allowing easy access for sample loading and chamber cleaning.</p> <p>Controls should mounted beside chamber for convenient operation.</p>	

		<p>Smoke density and temperature are on digital displays.</p>
		<p>Chamber walls are pre-heated for easier start-up and convenient equipment operation</p>
		<p>Safety blow-out panel, easily replaceable, allows for safe operation of test method</p>
		<p>Cabinet should have designed with a standard 19" rack.</p>
<p>5.5</p>	<p>Other Features</p>	<p>Furnance have to designed for allowingpotential of the Smoke at variable heat fluxes (up to 50 kW/m²).</p>
		<p>Equipment shoud have the facility for the horizontal rotation of the specimen with mass loss rate of the specimen.</p>
		<p>Equiment should have all facility to complie the test procedure as per the standard ISO 5659-2.</p>
		<p>Test chamber should have made up of stainless steel (SS 316) material.</p>
		<p>Two number of windows on the front and right side to observie the process.</p>
		<p>Equiment should also have all facility to complie the test procedure as per the standard ISO 11925-2.</p>

6	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above:
		Hard copies of Operational & Service Manual- 01 Set .
		Calibration Certificate for required parameters with Traceability.
7	Training	Onsite training (03 days) should be provided to the staff after installation. The Supplier shall provide all facilities for such training programme.
		Complete set of manuals for the operation of equipment should be given.
8	Scope of supply	Complete list of items quoted are to be provided
9	Intallation & Commissioning	The Machine should come with all other essential accessories & spares required for installation, commissioning & operation.

11. Fume Hood		
Sl. No.	Specification	Range / Value
1	Hood Type	Low Constant Volume (LCV) Type Bench Fume hood for Chemical synthesis Lab
2	Overall Dimension	Width 2000 X Depth 900 x Height 2000 or better
3	Inner Dimension	Width 1800 x Depth 600 x Height 1200 or better

4	Fume hood Superstructure	Structure frame: min. 2.0 mm thick GI construction.
		Inner lining, rear baffles and top baffles in min. 6.0 mm thick. Phenolic resin construction.
		Outer panels: min. 1.2 mm thick GI construction.
		Aerodynamic Shape front posts, in GI construction.
		Flip-on type Airfoil in min.1.6 mm thick SS – 316 construction
		Streamlined shaped exhaust duct collar in PP construction.
		Combination type, Frameless design Sash in toughened glass construction with full length sash handle in anodized Aluminium construction.
		Sash movement mechanism with counter weight.
		Twin vapour proof tube light (40 watts each) fitting with fluorescent lamps.
		PVC cable manager to avoid any cable dangling from equipment to sockets.
		Interior construction should be Chemical and heat resistant, smooth finish, easily cleanable panels.

5	Fume hood Worktop	In black colour natural granite construction (18 to 20 mm thick), having raised rails on all four sides, with 1 Number oval shaped cup sink (100 X 200 mm), in PP construction (molded polypropylene), for drainage with water tap on left side of fume hood.
6	Service Valves	Service valves should be located in the corner post on left hand side of the fume hood. It should having body in forged brass construction, extended spindle in brass construction, colour coded knobs (Yellow for air and Green for D. M. water) for fine control in plastic construction angular Shaped serrated nozzles, in epoxy coated forged brass construction 1.5 meter long flexible tubing with end fittings for following services: Compressed Air: PU-4 (1no.) DM Water : Nylon braided PVC Hose (1no.)
7	Electrical Services	5.0 A piano type switch for light – 1 Nos.
		5/15 A 3-pin Socket with switch (230 V, 6/16 A50 Hz along with 8 nos. MCBs) (4 nos. of 5 A and 4 nos. of 15 A) – 4 Nos.
8	Fume hood under structure	Fabricated out of heavy gauge rectangular shape hollow pipes in MS construction, duly finished with corrosion resistant specialty coatings.
9	Fume Hood Sash	Minimum 5 mm thick toughened glass in frameless construction and vertical rising type and combination type arrangements. Fume hood works with a pulley & counter weight mechanism with SS 316, multi wire flexible sash rope.
10	Baffle Design	3 points suction, fix type baffle arrangement for effective suction of light, medium and heavy fumes with baffle to ensure smooth and immediate exhaust of fumes.

11	Fume hood under-cabinets	Detachable design apparatus storage twin cabinets fabricated out of GI sheet
		Special arrangement for air ventilation inside the cabinet.
		Twin doors in double wall construction.
		FRP Lining in inside cabinet.
		Flushed type recessed handle.
		110 ° special design door hinges, Hinge cup/arm: nickel-plated steel.
		1 No. fixed shelf.
		Recessed base frame in heavy duty GI construction.
		Twin castors for easy removal of the cabinet.
		This Chemical storage shall be provided with two numbers exhaust ports with the rigid/flexible ducts connected to the exhaust passage of the fume hood.
Min. 200 mm dia. Duct damper in PP construction complete with 1 pre drilled flanges on both sides, manual operation handle and extended spindle, suitable for motorized drive.		
12	Training	Required training should be provided on operation and maintainance
		Complete set of manuals for the operation of equipment should be given.
13	Scope of supply	Complete list of items quoted are to be provided

14	Intallation & Commissioning	The Machine should come with all other essential accessories & spares required for installation, commissioning & operation.
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12. Hot Air Oven

Sl. No.	Specification	Range / Value
1	Application	The oven should capable to dry samples, glassware's and synthesis of materials with independent adjustable temperature.
2	Temperature Range	Ambient to 300 °C maximum or higher
3	Volume	250 litres minimum with provision of 3 wire trays spaced equi-distant from each other
4	Temperature Accuracy	±1°C or better
5	Controls	PID Controller
6	Temp Display	LED/TFT Colour Display
7	Sensor	PT-100 or equivalent
8	Timer	Digital Pre-Set Timer 999 Hrs
9	Dimension	Internal dimension : 650x800x500 mm or Equivalent in line with Volume capacity
10	Heating Element	Nichrome wire / Kanthal A1/ Titanium wire
		Multiple Over temperature protection
		Set Point Wait function

11	Other Features	Programme stored incase of power failure
		Electric leakage breaker
		Temperature safety as per DIN 12880 Class 3.1, EN 1539
		Forced air circulation by quiet air turbine adjustable in 10% steps.
		Vent connection with restrictor flap
		Self diagnostics for fault analysis
12	Blower	Blower is required
13	Interior& External Chamber	Corrosion resistant Steel 316 stainless steel with Chemical resistant stainless steel liner
14	Insulation	Glass Wool
15	Doors	Solid doors with silicone rubber gasket & lock
16	Shelves	Min 3 Stainless steel shelves (Removable) spaced equi-distant from each other Minimum Two nickel-chrome plated wire shelves
17	Power Load	As per Requirement considering the operataing temp. range
18	Spares	Stainless Steel Grid -02 nos
		Electrical spares of reputed make like Temperature sensors-01no

19	Other Mandatory Items	<p>While supplying the Machines, the supplier should also provide the following items apart from above: Hard copies of Operational & Service Manual- 01 Set . Calibration Certificate for Temperature with Traceability. Machine should come with all other essential accessories & spares required for installation, commissioning & Operation. The system should have the facility for temperature programming. The system should be supplied with suitable interface for use of data control system communication software.</p>
20	Training	Required training should be provided on operation and maintainance
		Complete set of manuals for the operation of equipment should be given.
21	Scope of supply	Complete list of items quoted are to be provided
22	Intallation & Commissioning	The Machine should come with all other essential accessories & spares required for installation, commissioning & operation.

13. Vacuum Oven		
Sl. No.	Specification	Range / Value
1	Application	The oven should capable to dry samples, glassware's and synthesis of materials with independent adjustable temperature.
2	Capacity	110 L or better
3	Temperature range	Ambient to 200 °C or better
4	Power range	1000 W to 1200 W

5	Display	LED/TFT colour display with at least 1°C resolution.
6	Temperature Resolution	0.1 °C or better
7	Controls	PID Controller
8	Interior& External Chamber	Corrosion resistant Stainless steel
9	Internal dimension	450x450x450 mm or Equivalent in line with Volume capacity
10	MOC Cabinet	Powder-coated heavy-gauge steel
11	MOC Chamber	Stainless steel
12	Door	Solid doors with silicone rubber gasket & lock
13	No. of shelves	03 or higher
14	MOC Shelves	Aluminum
15	Vacuum range	0 to 30 in. Hg

16	Pump	Suitable pump to achieve the desired vacuum range to be provided
17	Orientation	Horizontal type with chamber door to be opened in front
18	Safety interlocks	<p>a) Electrical Power fail /Restart on resuming power (manually selectable).</p> <p>b) Vacuum level controls for heating.</p> <p>c) Pneumatic Pressure failure.</p> <p>d) Vacuum oven door open/ Door closing confirmation.</p> <p>e) Ensure ambient Pressure to open the oven.</p> <p>f) Any Vacuum pump failure.</p> <p>g) Ground Fault (job touching on the heating element) Alarm/Switch off heating</p> <p>h) Over Temperature Alarm/ Switch off Heating.</p> <p>i) Programmer end Control. Alarm to operator, no restart any system automatically.</p>

		j) All other necessary interlocks for the health of the Oven & job.
19	Other Mandatory Items	While supplying the Machines, the supplier should also provide the following items apart from above:
		Hard copies of Operational & Service Manual- 01 Set .
		Calibration Certificate for required parameters with Traceability.
20	Training	Required training should be provided on operation and maintainance
		Complete set of manuals for the operation of equipment should be given.
21	Scope of supply	Complete list of items quoted are to be provided
22	Intallation & Commissioning	The Machine should come with all other essential accessories & spares required for installation, commissioning & operation.

14. Multi - Product Calibrator Multi Function Calibrator With 8.5 Digit Multimeter		
Sl. No.	Specification	Range / Value
I. Multi - Product Calibrator / Multi Function Calibrator		
1	APPLICATION	It is used to Calibrate a wide variety of electrical test such as frequency, Temperature simulation- Thermocouple, RTD, Resistance, DC /AC voltage, AC/DC Current, Capacitance, Power factor, Phase angle, Oscilloscope, AC/DC Power

2	Functional Requirement:	<ul style="list-style-type: none"> • The offered MFC shall be able to source AC/DC voltage, AC/DC current, AC/DC Power, frequency, resistance, capacitance. • It should also have capability to simulate thermocouple and RTDs. Additionally; there should be provision for calibration of oscilloscope. • The offered MFC should have capabilities to calibrate digital and analogue multi meters, frequency meters, ohm meters, AC/DC milli voltmeters, thermocouple and RTDs indicators, tachometers, clamp meters, and timer counters. • The 8.5 Digit Multimeter should be high performance and high accuracy with simple operation. It shall be used for laboratory calibration and verification purpose.
3	DC Voltage	<ul style="list-style-type: none"> • Range: 250 mV to 1000 V or better <u>Resolution:</u> • 100 nV or better @ minimum Voltage • 1000 μV or better @ Maximum Voltage <u>Stability @ $\pm 1^{\circ}$C for 24 hrs:</u> • ± 5 ppm + 10 μV or better @ minimum • ± 5 ppm + 500 μV or better @ maximum
4	AC Voltage	<ul style="list-style-type: none"> • Range: 100 mV to 1000 V or better <u>Resolution:</u> • 1 μV or better @ minimum • 10 mV or better @ Maximum
5	DC Current	<ul style="list-style-type: none"> • Range: 0.25 mA to ± 10 A or better <u>Resolution:</u> • 1 nA or better @ minimum • 100 μA or better @ Maximum
6	AC Current	<ul style="list-style-type: none"> • Range: 250 μA to 10 A or better <u>Resolution:</u> • 10 nA or better @ minimum • 100 μA or better @ Maximum
7	Capacitance	<ul style="list-style-type: none"> • 1 μF to 100 μF or better • Best Accuracy: 0.2 % or better

8	Variable Resistance	<ul style="list-style-type: none"> • Range: 1Ω to 100MΩ or better <u>Resolution:</u> • 0.1 m Ω or better @ minimum • 1 m Ω or better @ Maximum <u>Stability @ ± 1°C for 24 hrs:</u> • ± 50 ppm or better @ minimum • ±100 ppm or better @ maximum
9	Temperature calibration (Thermocouple)	<ul style="list-style-type: none"> • Range & type: -210 to 2315°C (type J, K, R, T, S, B, E, N,C,L,U) or better • Best Accuracy: ± 0.10°C or better
10	RTD simulation	<ul style="list-style-type: none"> • Range: -100 to 500°C or better • Best Resolution: 0.01°C or better
11	Oscilloscope calibration	<ul style="list-style-type: none"> • Amplitude • Range: 2 mV to 200 V (1 M Ω) and 1 mV to 2 V 50 Ω (Square-wave or DC) • Best Accuracy: ± 0.05% • Frequency / period • Range: 0.1Hz to 100MHz / 10ns to 10s (fixed values 1, 2, 5 sequence) • Accuracy: ± 0.1ppm (0.1Hz to 10MHz / 100ns to 10s) • ± 20ppm (20, 50, 100MHz / 50, 20, & 10ns) • Duty Cycle • 3 frequency: 100Hz, 1kHz, 10kHz, settable from 0 to 100% • Fast-Rise • < 400ps. Bandwidth checking up to 400MHz • 600 MHz to 1GHz leveled sine-wave (0.5, 1, 1.5V pk-pk)
12	Power AC/DC	<ul style="list-style-type: none"> • Current: upto 20 A, Voltage: upto 1000 V, Power: upto 20 kW or better • Frequency: 40 to 500 Hz, Phase: ± 90°, Power Factor: 0.00 to 1.00 PF or better
13	Clamp Meter Adaptor	<ul style="list-style-type: none"> • Coil Turn : 50 • Range: AC/DC Current up to 1000A (DC, 45 to 90Hz) or higher • Best Accuracy: ± 0.5%

14	Interfaces	IEEE-488 (GPIB), RS-232
15	Environment	Operating temperature range: 10°C to 40°C
16	Mains power supply	Single Phase 230V, 50Hz
17	Accessories to be quoted and supplied along with machine / equipment	Test lead set, Control Software, PC interface cable, Calibration certificate (NABL/UKAS) & User manual.

II. 8.5 Digit Multimeter

1	Functional Requirement:	The 8.5 Digit Multimeter should be high performance and high accuracy with simple operation. It shall be used for laboratory calibration and verification purpose.
2	Resolution	8.5 digit or better
3	Measurement confidence	10 ppm or better
4	Measurement Speed	100,000 readings/s or better
5	DC Voltage	<ul style="list-style-type: none"> • Range: upto 1000 V or more <u>Maximum Resolution:</u> • 10 nV or better at minimum • 100 μV or better at maximum

6	AC Voltage	<ul style="list-style-type: none"> • Range: 0 – 30mV to 3kV or more <p><u>Maximum Resolution:</u></p> <ul style="list-style-type: none"> • 10 nV or better at minimum • 100 μV or better at maximum
7	DC Current	<ul style="list-style-type: none"> • Range: upto 1 A or more <p><u>Maximum Resolution:</u></p> <ul style="list-style-type: none"> • 1 pA or better at minimum • 100 nA or better at maximum
8	AC Current	<ul style="list-style-type: none"> • Range: Upto 1 A or more <p><u>Maximum Resolution:</u></p> <ul style="list-style-type: none"> • 100 pA or better at minimum • 100 μA or better at maximum
9	Resistance	<ul style="list-style-type: none"> • Range: up to 1GΩ or more <p><u>Maximum Resolution:</u></p> <ul style="list-style-type: none"> • 10 $\mu\Omega$ or better at minimum • 100 Ω or better at maximum
10	PRT (PT100) Temperature	<ul style="list-style-type: none"> • Support thermocouple, PT sensor
11	Frequency	<ul style="list-style-type: none"> • Range: 10 – 100kHz or higher • Best Resolution: 1Hz or better • Best Accuracy: 0.05% of reading or better
12	Interfaces	IEEE-488 (GPIB), RS-232
13	Environment	Operating temperature range:10°C to 40°C
14	Mains power supply	Single Phase 230V, 50Hz

15	Accessories to be quoted and supplied along with machine / equipment	• Test lead set, Control Software, PC interface cable, Calibration certificate (NABL/UKAS) & User manual.
16	Training	Required training should be provided on operation and maintainance
		Complete set of manuals for the operation of equipment should be given.
17	Scope of supply	Complete list of items quoted are to be provided
18	Intallation & Commissioning	The Machine should come with all other essential accessories & spares required for installation, commissioning & operation.

15. Black Body (35°C to 500°C)		
Sl. No.	Specification	Range / Value
1	Type	Portable; for onsite calibration
2	Temperature Range	35 °C to 500 °C or higher
3	Accuracy	$\pm 0.35^{\circ}\text{C}$ or better at 35°C
		$\pm 0.50^{\circ}\text{C}$ or better at 100°C
		$\pm 0.75^{\circ}\text{C}$ or better at 200°C

		± 1.50 ⁰ C or better at 350 ⁰ C
		± 2.0 ⁰ C or better at 500 ⁰ C
4	Stability	± 0.1 ⁰ C or better at 35 ⁰ C
		± 0.30 ⁰ C or better at 200 ⁰ C
		± 0.50 ⁰ C or better at 500 ⁰ C
5	Uniformity (5.0 in dia of center of target)	± 0.20 ⁰ C or better at 35 ⁰ C
		± 0.70 ⁰ C or better at 200 ⁰ C
		± 1.50 ⁰ C or better at 500 ⁰ C
6	Uniformity (2.0 in dia of center of target)	± 0.20 ⁰ C or better at 35 ⁰ C
		± 0.3 ⁰ C or better at 200 ⁰ C
		± 0.70 ⁰ C or better at 500 ⁰ C
7	Heating Time	60 min: 35 ⁰ C to 500 ⁰ C or better

8	Stabilization time	15 minutes or better
9	Nominal emissivity	0.95 or better
10	Thermometer Emissivity Compensation	0.9 to 1.0 or better
11	Target Diameter	152.4 mm (6 in) or better
12	Power	94–234 VAC ($\pm 10\%$), 50/60 Hz
13	Computer Interface	RS-232 included with free Interface-it software
14	calibration certificate	Traceability certificate should be provided from national and international accredited body
15	Accessories to be quoted and supplied along with machine / equipments:	Carrying Case
16	Training	Required training should be provided on operation and maintainance
		Complete set of manuals for the operation of equipment should be given.
17	Scope of supply	Complete list of items quoted are to be provided
18	Intallation & Commissioning	The Machine should come with all other essential accessories & spares required for installation, commissioning & operation.

16. Force Proving Rings (100N, 2kN, 20kN, 200kN)

Sl. No.	Specification	Range / Value
1	Purpose	It is used to calibrate the compression & Tension Force
2	Loading pattern	Compression & Tension
3	Capacity	100 N, 2 kN, 20 kN, 200 kN,
4	Display type	High Resolution Colour Touch LCD or better
5	Class	1 or better
6	Reproducibility	0.2% or better
7	Repeatability	0.1% or better
8	Error of interpolation	± 0.1% or better
9	Hysteresis	0.3% or better
10	Creep (in 30 minutes)	0.1% or better
11	Zero Return	± 0.05% or better
12	Nominal emissivity ³	0.95 or better
13	Display Resolution	For 2 kN, 20kN : - 0.0001kN or better
		For 200kN: - 0.01kN or better

14	Measurement Units	N, kN, kgf, lbf or better
15	Mode of Operation	Trace, Peak, Auto Peak or better
16	Plug and Play Sensors (No. of Sensors)	7 or better
17	Data Storage & Logging	Upto 9999 as Calibration Reports or better
18	Calibration Sequence and Report Capture as per ISO 7500-1	Automated Sequence to ensure data credibility
19	Data Transfer Options	USB-PC or Pendrive
20	Operating Temperature	-7.6 10 °CVDC, to +65°C or better
21	Construction	Aluminium or better
22	calibration certificate	Traceability certificate will be provided from National and international body
23	Accessories	Carrying Case
24	Training	Required training should be provided on operation and maintainance
		Complete set of manuals for the operation of equipment should be given.
25	Scope of supply	Complete list of items quoted are to be provided
26	Intallation & Commissioning	The Machine should come with all other essential accessories & spares required for installation, commissioning & operation.

17. Thermo Gravimetric Analyser (TGA)

Sl. No.	Specification	Range / Value
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1	Purpose	<p>TGA is used to determine the following properties of polymer:</p> <ul style="list-style-type: none"> Ø Weight loss as a function of temperature or time thermal stability Ø Heat resistance Ø Filler content Ø Moisture content Ø Amount of volatiles Ø Kinetic studies of Polymers, rubbers and elastomers.
2	Principle/ Definition	A method of thermal analysis in which changes in weight of materials are measured as a function of increasing temperature (with constant heating rate), or as a function of time (with constant temperature and/or constant mass loss).
3	Reference Standard	ASTM E1131 - 08(2014), ASTM D3850 - 94(2006), ISO 11358-1:2014
4	Balance Sensitivity:	1 µg or Better
5	Balance Measurement Range:	Up to 1 g or more
6	Weighing precision:	0.01% or better.
7	Signal Resolution:	0.002 µg
8	Temperature Range:	Ambient to 1000 °C or more
9	Temperature measurement accuracy:	± 1 °C or better

10	Temperature Accuracy:	$\pm 1\text{ }^{\circ}\text{C}$ or better
11	Dynamic Temperature Precision	$\pm 1\text{ }^{\circ}\text{C}$ or better
12	Isothermal Precision	$\pm 1\text{ }^{\circ}\text{C}$ or better
13	Heating rate:	0.1 $^{\circ}\text{C}$ /minute or lower to 100 $^{\circ}\text{C}$ /minute
14	Cooling time:	10 min or better, any cooling accessory required should be quoted
15	Sample Pans:	Platinum Pans 10 Nos., Alumina Pans – 10 Nos., Lid for Platinum Pans -10 Nos., Lid for Alumina Pans- 10 Nos, Quartz Crucible 10 Nos. Aluminium Pans -500 Nos. with crimping machine (if necessary)
16	Chiller:	Suitable inbuilt chiller with CE certification should be quoted.
17	Gas Flow Control:	System must include software programmable mass flow controller (2 or more) for convenient & precise gas control and switching between gases (Inert & Air).
		The system should be able to perform under flowing inert and /or active gases, static as well as vacuum atmosphere. All vacuum accessories required should be quoted

18	Atmosphere:	<p>The system should also be suitable to perform adsorption studies of gases such as NH₃, CO, CO₂, H₂ etc. from a 1 % or more mixture of these gases in an inert gas. The quoted MFC should be able to control the flow rate of such gases. All other accessories required to perform adsorption studies should be quoted.</p>
19	Gas cylinder:	<p>High purity (99.999%) nitrogen, zero air gas cylinder (capacity 47 litre) with double stage double meter gas regulator with stainless steel diaphragm and pressure gauge suitable for above cylinder should be quoted</p>
20	Software	<p>The latest Microsoft windows-based user-friendly software should be supplied. The software should have the ability to data access, storage and analysis. The software should also have the ability to Plot thermal curves for TGA against time and or/temperature. Calculate derivative of TG data and plot DTG curves. Baseline correction, integration and prepare overlay of curves. Possibility of converting data into ASCII format and export the same for further manipulation.</p>
21	Others	<ul style="list-style-type: none"> · For the entire third-party item being quoted the model and make should be specified in the quotation · System should be supplied with latest branded PC and Printer. · To supply necessary spares and accessories <p>The TGA must be easily interfaced to FTIR. The necessary accessories to be supplied</p> <ul style="list-style-type: none"> · Kinetics software, based on model free iso conversional method-based algorithm
		<ul style="list-style-type: none"> · Calibration certificate to be produced wherever required traceable to NIST

22	Calibration	CRM (Nickel, Calcium Oxalate Monohydrate or equivalent) Standard weight of 1 mg & 100 mg (with certificate)
23	Warranty	02 years
24	Training	Required training should be provided on operation and maintainance
		Complete set of manuals for the operation of equipment should be given.
25	Scope of supply	Complete list of items quoted are to be provided
26	Intallation & Commissioning	The Machine should come with all other essential accessories & spares required for installation, commissioning & operation.