

Technical Specification for Tender No. 2022-23/07 Released Government E - Marketing (GeM Portal)

Limiting Oxygen Index (LOI) Tester		
Sl. No.	Specification	Range / Value
1	Make / Model	Bidder to specify
2	Purpose	To measure the minimum concentration of oxygen that will support combustion of a polymer
3	Applicable standard	ASTM D2863, ISO 4589-2
4	Digital Read out for oxygen concentration	±0.1% or equiv.
5	Test Chimmney	Made of heat resistant glass tube of inside diameter of 75 – 100 mm, and 400 – 500 mm height.
		The bottom of the chimney or the base to which the tube is attached shall contain non-combustible material to mix and distribute evenly the gas mixture entering at this base. Glass beads of size 3 to 5 mm in diameter in a bed 80 to 100 mm deep have been found suitable. The chimney shall be mounted securely on the base to prevent air leak.
		A lid of 40 mm diameter to the glass tube at the level at least 10 mm above the top of the cylindrical chimney.
		A gauze / wire screen making partition between combustible medium and tube to catch the falling fragments and keep the column clean.
		– Small holding device that supports the specimen at its base and hold it vertically in the center of the chimney to be provided (For self-supporting specimen).

6	Specimen holder	For samples which are flexible the specimen shall be supported by both vertical edges in aflame with reference marks at 20 and 100 mm below the top of the frame. The profile of the holder and its support shall be smooth to minimize induction of turbulence in the rising flow of gas.
7	Gas measuring and controlling devices	Capable of controlling the gas velocity through the chimney is 40 ± 2 mm/s Calibrated pressure regulators and pressure gauges to be provided on the individual gas supply lines Needle valves and calibrated flow meters to be provided individually for each gas lines
8	Timer	capable of measuring time with an accuracy of ± 0.5 s. Maximum: 600 sec. Digital display to be provided
9	Flame Ignitor	Suitable flame ignitor having adjustable LPG fuel supply to be provided
10	Features	Paramagnetic Oxygen Cell for assessing accurate oxygen (< 0.1%) levels Compact unit for efficient use inside a laboratory hood, with ventilation Digital selection of oxygen concentration by push-button control Adjustment of oxygen and nitrogen flow shall be automatic to achieve the desired oxygen concentration Digital Display: Instrument status, oxygen concentration, flow rate, chimney temperature, elapsed time Uniform combustion atmosphere Dual inlet gas pressure gauges, 0-100 psi

		Ignition wand with variable gas control valve
		Smoke density measurement system with chart recorder
		Ventilation hood compatible with the instrument to be supplied
11	Additional Requirements	Transparent radiant heated test column
		All necessary control valves, flow meters and filters shall be built in and the instrument making it easy to use
		Suitable for Testing of Polymers, Rubbers, Fibers, Films, FRP products, Composites & allied Products
12	Other Mandatory Items	Required filled gas Cylinders (Nitrogen & Oxygen) with best quality regulator
		Required filled gas Cylinders (Nitrogen & Oxygen) with best quality regulator
		Machine should come with all other essential accessories & spares required for installation, commissioning & operation. Bidder should specify and quote for any other accessories required / available for better usage of machine.
13	Scope of Supply / Bill of Material	Bidder should submit Scope of Supply / Bill of Material with make model of each items.
		Hard copies of operational & service manual - 01 set
14	Warranty	Minimum Two years from date of installation

FT-IR Spectrometer		
Sl. No.	Specification	Range / Value
1	Wave number	4000 - 500 cm^{-1} or better
2	Spectral resolution	0.8 cm^{-1} ; or better
3	Signal to Noise ratio	40000 : 1 or better (peak to peak)

4	Detector	Temperature controlled DLATGS detector
5	Beam splitter	ZnSe beam splitter with ZnSe window
6	Light source	Solid state laser
7	Sample Interference	ATR – Attenuated Total Reflection (Monolithic diamond) to meet the range
8	Internal Validation	Performance validation through inbuilt calibration with NIST traceability standards
9	Library	Library consisting of minimum 10000 spectra which includes Polymeric materials, blends,chemical compounds,Fuels and oils shall be provided.There should option to create open library.
10	Standard	Shall meet ASTM E 1252
11	Warranty	3 years. Interferometer, Source and laser warranty of 10 years.
12	Other features	· Diamond ATR
		· ATR Crystal- Diamond
		· liquid cell holder
		· Replacement dessicant
		· Liquid Cell Window
		· Liquid Cell Window material
		Mirror should be gold coated
		· Provision to upgrade with microscope and TGA in future.
		CRM with NIST tracebale/NABL accredited calibration certificates to be supplied
		PC (i5Processor) Printer B/W Laser -01no each, Online UPS 3KVA with 30 Min Back up

13	Technical Support and Service	The supplier shall be responsible for installation and commissioning of equipment at Customer site. Machine shall be supplied with all necessary accessories for installation, commissioning and operation
14	Software	Spectral comparison option should be available
		Software shall be capable to carryout various blend analysis and Peak Intergration functions suitable for Petrochemical/Polymer Identification.
		Mixture analysis
		Peak labelling
		Peak integration functions(Area,height)
		Quantification option should be available
15	Terms & Conditions	Easy export of data in excel
		Manufacture/Supplier should have sizable installations of same or better model worldwide and at least one in India which is education institutions/Research Testing centrally funded institution.
		A Satisfactory Performance certificate from at least one Customer to be provided for eligibility. Bidder should submit complete contact details.
		Service Support: reporting time within 24 hours after officially request for service.
		Installation & Demonstration: in the scope of Seller.
Hard copies of operational & Service manual -01 set		
Loading & Unloading: in the scope of Seller.		

Colour Spectrophotometer		
Sl. No.	Specification	Range / Value
1	Make / Model	Bidder to specify
2	Purposes	Benchtop spectrophotometers to be provided to measure Colour, Grey Scale rating and Yellowness Index as per various Indian and International standards.

3	Application	Suitable for measurement of plastics,paints,coatings,cosmetics
4	Applicable standard	ASTM E313, ASTM D1925, ASTM E1164, DIN 5033 Teil7, JIS Z 8722,ISO7724/1,CIE No15 (2004)
5	Measurement principle& Mode	Dual beam spectrophotometer & Reflectance and Transmittance with UV cutoff filter
6	Illumination Source	Light Source : Pulsed xenon lamps
6	Detector	Silicon Photodiode array
7	Aperture Plates	Measurement area/ Illumination Area LAV: Φ 25.4 mm / Φ 30 mm LMAV: Φ 16 mm / Φ 20 mm MAV: Φ 8 mm / Φ 11 mm SAV: Φ 4 mm / Φ 7 mm
		Aperture detection to be provided
		Measurement area/ Illumination Area LAV: Φ 25.4 mm / Φ 30 mm
8	Lens switching for LAV/SAV	Automatic
9	Wavelength Range	360 - 700 nm or better
10	Resolution	<3nm
11	Reporting interval	10 nm equivalent triangular
12	Photometric range	0 -150% or more
13	Photometric Resolution	0.01%
14	Lamp and Lamp life	1 billion flashes or better

15	UV cutoff filters	UV Setting : Instantaneous numerical adjustment of UV with no mechanical filter movement required ; 400 nm and 420 nm UV cutoff filter
17	Transmission sampling aperture size	Illumination Area / Measurement Area: Transmittance: Approx. 24 mm/ 17mm
18	Haze measurement	haze measurements should be available
19	Calorimetric repeatability	For white tile: $\Delta E^* < 0.09$ or better for 1.75 inch 20 read repeatability on white tile using double flash
20	Equipment to be supplied with all essential Accessories such as:	Calibrated white UV Fluorescent Standard with NIST Traceable certificate of calibration - 01no
		Sample Cup Opaque Cover - 01 no
		Glass Sample Cup (2.5in) - 04 nos.
		Port insert, 2.5in Glass sample cup holder-01no
		Sample Clamp Assembly - 01 no
		Other parts like cable, adopter, power cord to be provided
		Black Calibration light Trap
		Operation manual
21	Color matching software to measure: L, a, b, Δxyz	Suitable advanced software inbuilt with instrument to analyse L, a, b, ΔE , yellowness index, grey scale rating, etc. Software must be perpetual with all latest advance modules.
		While supplying the Machine, the supplier should also provide the following items apart from above:
		Branded PC of best configuration with necessary software including software for colour matching & suitable for the instrument operation, Colour printer
		Power cable

<p>22</p>	<p>Other Mandatory Accessories to be quoted and supplied along with machine / equipment</p>	<p>Hard copies of Operational & Service Manual(Hard copies of Operational & Service Manual- 01 set and certified reference material.)- 01 set and certified reference material.</p> <p>Machine should come with all other essential accessories & spares (as per IS, ASTM & ISO standards) required for installation, commissioning & operation. Bidder should specify and quote for any other accessories required / available for better usage of machine.</p> <p>Onsite free operational Training</p> <p>operational confidence with an included 5-year warranty</p> <p>Calibration certificate traceable to NIST should be provided</p>
<p>23</p>	<p>Scope of Supply / Bill of Material</p> <p>Technical Support and Service</p>	<p>Bidder should submit Scope of Supply / Bill of Material with make model of each items.</p> <p>1. The Supplier Shall be responsible for carrying out the installation and Commissioning at customer site. 2. Machine Should come with all other essential accessories & spares required for installation, commissioning & operation.</p>
		<p>1.Tenderer should be the manufacturer / authorized dealer. Letter of Authorization from original equipment manufacturer (OEM) specific to the tender should be enclosed.</p> <p>2.Technical catalogue of the Equipment quoted along with model no. should be available at OEM website</p> <p>3.An undertaking from the OEM is required stating that they would facilitate the tenderer on a regular basis with technology/product updates and extend support for the warranty as well</p> <p>4.OEM should be Nationally/Internationally reputed Company.</p>

25	Other terms and conditions	5.Non-compliance of tender terms, non-submission of required documents, lack of clarity of the specifications, contradiction between tenderer specification and supporting documents etc. may lead to rejection of the bid.
		6.Submit all supporting information with respect to the technical data, drawings or booklets of product along with test certificates available may be enclosed
		7.All supplies are subject to pre delivery inspection and approval before acceptance.
		8.In the event of the ordered item failing to pass the acceptance test, a period not exceeding three weeks will be given to rectify the defects and clear the acceptance test, failing which the purchaser reserve the right to get the equipment replaced by the supplier at no extra cost to the purchaser.
26	Warranty	Minimum Two years from date of installation

GC - MS With Pyrolyzer		
Sl. No.	Specification	Range / Value
1	Applications	Separation and identification of solids/liquids/gaseous and their mixtures that includes unknown samples, polymers, pesticides, organic compounds, pharmaceutical ingredient etc.
	General Technical	
2	Gas Chromatograph system	Instrument detection limit should be ≤ 10 fg OFN for Statistically derived at 99 % confidence level from the area precision of 8 sequential splitless injections of 100 fg OFN standard. MS Ions of m/z 272 and/or 222 using 30m long column
3	Ionization mode	Electron Impact (EI)
4	Detector	Flame Ionization Detector (FID) should be provided which can be coupled with the Gas chromatographic system.

5	Data acquisition /operating system	Data acquisition /operating system System should be capable of supporting two inlets and TWO detector ports simultaneously and with Mass Spectroscopy; should have electronic pneumatic/pressure controls for all the gases and should have Chromatography Data system which is based on Microsoft Windows operating system for instrument control, data acquisition, data analysis, quantization, automation & customization with online and offline sessions provided.
	Column Oven	
6	Columns	Provision to install atleast two column
7	Operating temperature	Ambient +4 °C to 450 °C or better.
8	Temperature set point resolution	1°C or better
9	Maximum temp ramp rate	120 °C /min or more
10	Cooling rate	From 450 °C to 50 °C: within 4 minutes or better
11	Temperature programming	Should have minimum 9 ramps & 10 Plateaus
	Pyrolyzer	
12	Make and model	Bidder to specify
13	Type	pyrolyzer compatible with GC-MS
14	Temperature range	Upto 1000 deg.C or better,Programmable Temperature,Auto sample positioning
15	Furnace cooling rate	Temperature to go down from 800 deg.C to 50 deg.C within 10 min.
16	Sample to be analyzed	Solid and viscous liquid
17	Control	Should be provide with software control with F-Search System with libraries for Evolved gas analysis, polymer and additives
	Injection port	
18	Injection port-2 nos Split/Splitles to	1. Split/Splitles sinjection port with electronic pressure control (EPC)/ programmable pneumatic control(PPC) /advanced flow control (AFC) with fast GC capability Possible to use capillary columns of 100µm to 530µm columns

--	quote	Digital display of gas flow, temperature etc. Manufacture's software controlled (AFC/EFC/APC/EPC controlled).
19	Pressure range	100 psi or better
20	Maximum temperature	400 ° C or more
21	Heating zones	Should have independently heated zones
23	Auto Injector-liquid	Auto Injector with Auto Sampler-Liquid . An Auto Sampler device having a capacity to hold at least 15 vials capacity or more. Provision for injecting into both injectors from software without dismantling hardware or any manual alignment.
	GC Detector Specifications (FID)	
24	FID detector	Having an MDL:<3 pgc/s or better
25	Linear dynamic range	>107 or better
26	Mass range	m/z up to 1000 unit or better
27	Mass Analyzer	Should have inert/metallic quadrupole massfilter with pre-filter or equivalent technology
28	Mass axis stability	Should be ±0.10 amu over 48 hrs
29	Scan speed	up to 10,000 u/sec or more
30	Ion source temp	upto 350 ° C or better and it should be programmable.
		It should be cable less source for easy cleaning and maintenance.
31	Ionization mode	EI
32	Filament	Minimum single filament
33	The sensitivity of system should be a followed and demonstrated at site	EI 1500:1 for 1pg of OFN or better
34	Turbo Molecular Pump (TMP)	255 L/sec or better capacity
35	Resolution	Selectable, 0.7 to 2.0 Daltons or more

36	WorkStation Instrument Control Software	GC and MS system should be combined with the same workstation for simultaneous settings and programming.
		Should have Auto tune (to optimize MS parameters automatically) feature
		A user friendly automatic data collection and analysis system compatible with Microsoft Windows OS and Microsoft Office suite applications
		NIST Library should be provided.Support to be provided for updation of library
37	Sample preparation	Qucheers Kit: 2 No.
38	Spectral Library	Latest mass spectral library (NIST2020) to be supplied in CD (licensed) for polymers including chemical compounds for rubbers, additives, pesticide, insecticide, etc.
39	Accessories to be quoted and supplied along with machine / equipment	Branded latest suitable PC compatible with GC-MS system having HDD Graphics display, 20"LCD/LED Monitor alongwith a good quality printer (should specify the PC and printer model).
		UPS: 10 KVA UPS with at least 60 min back up is needed.
		Supporting Table for installation of equipment and computer to be provided
		High quality He, H2, N2, Argon & Zero Air gas cylinders alongwith compatible regulators, gas purification panel for the above mentioned gases,and required tubings should be provided.
		Following accessories to be provided 1.Syringes for manual and autosampler injection (minimum pack of 10 each), 2.Filaments (minimum 2 no.) 3.capillary column of RTX1MS (30 mtr) and RTX 5MS of (30 mtr) (desired 1 no.each), 4.Ferrules for each column - 20 nos each, 5.Septa- 50 nos, 6.Vacuum oil-1 Litre, 7.Liner sealing ring – each Qty 10

Mechanical accessories (tool-kit etc) and consumable spares (Vials, Septa, Ferrules etc.) for the operation and maintenance of the instrument should be provided to meet our needs for at least 1 year.

1. Installation Qualification (IQ) and Operational Qualification (OQ) should be performed at the time of installation and commissioning.

2. 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 technical training (minimum 5 working days) in analyzing and troubleshooting should be given by the technical professionals

4. A list of references in India, where similar systems have been installed, must be provided and this will be taken very seriously while making the decision. Your post sales service feedback will certainly be a deciding factor

5. Complete set of manuals on operation, maintenance of the system in hardcopy as well as soft copy should be provided in English.

GC and MS system should be integrated with the same workstation for simultaneous settings and programming

6. Tenderer should be the manufacturer / authorized dealer. Letter of Authorization from original equipment manufacturer (OEM) specific to the tender should be enclosed.

7. Technical catalogue of the Equipment quoted along with model no. should be available at OEM website

<p>40</p>	<p>Other terms and conditions</p>	<p>8.An undertaking from the OEM is required stating that they would facilitate the tenderer on a regular basis with technology/product updates and extend support for the warranty as well</p> <p>9.OEM should be Nationally/Internationally reputed Company.</p> <p>10.Non-compliance of tender terms, non-submission of required documents, lack of clarity of the specifications, contradiction between tenderer specification and supporting documents etc. may lead to rejection of the bid.</p> <p>11.Submit all supporting information with respect to the technical data, drawings or booklets of product along with test certificates available may be enclosed</p> <p>12.All supplies are subject to pre delivery inspection and approval before acceptance.</p> <p>13.In the event of the ordered item failing to pass the acceptance test, a period not exceeding three weeks will be given to rectify the defects and clear the acceptance test, failing which the purchaser reserve the right to get the equipment replaced by the supplier at no extra cost to the purchaser.</p> <p>14.The entire system should be installed by the company professionals at oursite. A thorough technical training (minimum 5 working days) in analyzing and troubleshooting should be given by the technical professionals</p>
<p>41</p>	<p>Warranty</p>	<p>Minimum Three year from date of installation</p>

High Resolution Inductively Coupled Plasma Optical Emission Spectrometer (ICP - OES)

Sl. No.	Specification	Range / Value
1	Introduction	A compact high performance Dual View ICP system is required for the routine measurement of major and minor elements in a variety of general samples and research samples.
		The ICP should be simultaneous in all aspects of measurements including simultaneous measurements of all analytic wavelengths, internal standard, and background using polychromator system.
2	Optical System	The instrument shall be equipped with a high energy Echelle Cross Dispersion Spectrometer with focal length of less than 400mm & a “side by side” arrangement of prism and grating.
		Emission spectra shall be dispersed in both wavelength and order in a 2 dimensional array
		The optical purge shall be with either argon or nitrogen to allow measurement of signals in the low UV part of the spectrum. The instrument shall operate with a reduced purge flow include a standby flow of 1 lpm or less to minimize gas consumption.
3	RF Generator	The Solid state water cooled RF generator must run at a frequency of 40 / 27 MHz or suitable frequency (to deliver variable power output from 1000-1500 Watts OR better in ≤ 10 W increment)
		The generator shall have a high coupling efficiency of >75% and be directly coupled with a swing frequency impedance control and power regulation to better than 0.1%.
		RF power should be minimum 1500 watt in both axial and radial mode and variable with 10 watts or less in increment
		Argon Gas consumption should be as low as possible.
		Preferably 8 to 10 lit/min or similar, including optics purge

4	Plasma / Auxiliary / Nebulizer Gases	<p>Shear gas should be avoided for better resolution & sensitivity.</p> <p>Variable flow rates for Nebulizer (0 to 1.5 L/min or more in 0.01 L/min increments), auxiliary(0 to 2.0 L/min in 0.1 L/min increment) and plasma Argon flows (8 to 20 L/min in 0.1L/min increments) for the better optimization of the method.</p>
5	Standard Sample Introduction Kit / Peristaltic Pump	<p>Sample introduction shall be via an integral, close coupled and variable speed, peristaltic pump with a minimum of 12 rollers. The pump shall have a minimum of 4-channels to accommodate sample, drain, online internal standard and hydride generation line all together.</p> <p>An high efficiency cyclone spray chamber fitted with a high performance glass concentric nebulizer shall be provided for optimum stability and best detection limits with fast washout and minimum cross contamination. Peristaltic pump should be from 0.4 mL to 7 mL / min variable in 0.1 mL/min increments</p> <p>A semi demountable quartz ICP torch with separate injector shall be provided for maximum flexibility.</p>
6	Plasma Viewing	<p>Torch orientation should be Vertical and plasma can be viewed axially as well as radially The System has optics allowing to collect light in radial as well as axial and the wavelength can be acquired in radial, axial or both the modes</p> <p>The viewing height of the plasma must be adjustable under computer control to enable optimisation whilst the plasma is lit, in complete safety to the operator.</p> <p>The instrument shall have the possibility to automatically switch between axial and radial view (dual view) during an analysis.</p>
7	Resolution	<p>The instrument shall have the capability to perform measurements in routine operation with a Minimum optical resolution of 0.009 nanometer or better.</p>

8	Wavelength Range	The instrument shall be able to operate over the minimum range of 170 to 780 nm or better.
9	Detector	<p>The instrument shall be equipped with solid state CCD/CID Detector,</p> <p>The Detector shall be maintained at low temperature and should be able to attain the required temp in 10 mins or equivalent and background noise resulting in enhanced detection limits.</p>
10	Detector Operating Modes.	The detector must be capable of measuring all the analytes in the single analysis with wide linear dynamic range.
11	Software	<p>The instrument system software shall be based on the Windows operating system. The software shall provide full control of all instrument functions including plasma ignition, gas flows, viewing position, and monitoring of safety interlocks.</p> <p>Specification</p> <ul style="list-style-type: none"> - Full instrument control with the ability to display parameters and instrument response in real time. - Fully automated system start up and shutdown via the instrument control window. - Real time graphics for instrument setup and monitoring. - All set up parameters including plasma position to be stored on disk. - Internal diagnostics including error checking and complete fault log. - Automatic identification of possible spectral interferences when selecting wavelengths for analysis. Search mode for identification of unknown wavelengths should be available

		<p>- Automatic identification of possible spectral interferences when selecting wavelengths for analysis. Search mode for identification of unknown wavelengths etc should be available</p>
<p>12</p>	<p>Microwave Digestion System</p>	<p>Vendor should provide Microwave Digestion System for 8 or more reaction vessels simultaneously with individual pressure active control on reference vessel positions. Make and model no. to be quoted.</p>
		<p>Applications : For acid digestion applications of samples like plastics, water, wastewater, soil, sludge, environmental samples, natural products, plant materials, etc. for further analysis with AAS, ICP – OES or ICP – MS techniques.</p>
		<p>Microwave Cavity : The cavity chamber must be made of corrosion resistant Stainless steel with multilayer fluoropolymer coating for physical protection as well as chemical resistance and should be less than 8 ltrs</p>
		<p>Microwave Power : Delivered power: 1000 watts or more using 1 or 2 magnetrons</p>
		<p>Controller : In-built color touchscreen display with real-time graphical representation of reaction parameters and display of internal temperature of every individual reaction. External/ detachable controllers not acceptable.</p>
		<p>Rotor: System should be offered with rotor of minimum 12 position or more with 12 vessels</p>
		<p>Rotor Stability : Rotor should be made of lightweight AL Material for high pressure strength up to 150 bar or more and to ensure ultrafast cooling.</p>

		<p>Vessel material: PTFE- TFM Vessel volume: 50 ml or more Minimum filling volume : 3 ml or less Max operating temperature: 250 °C or more Max operating pressure: 45 bar or more Maximum vessel pressure : 80 bar or more Sample weight: Minimum 1.5 gms or higher per vessels Vessel safety: Closure of the vessel must be possible by hand and overpressure release mechanism of the vessel must be controlled for precise opening pressure independent of the reaction temperature or sample weight. Venting with polymer/ plastic material springs not acceptable due to dependence on internal temperature and sample weight.</p>
		<p>Temperature calibrator: A temperature calibrator for accurate temperature measurement must be supplied along with the instrument with minimum 3 years validity</p>
		<p>Cooling: Instrument should have built in exhaust for cooling the vessels inside the oven from 180 °C to 70°C in less than 15 min. Documentary evidence to be provided.</p>
		<p>Micro sample facility: Instrument should be offered with glass inserts minimum 100 number for carrying out digestion with 1ml acid and for micro sample.</p>
13	Chiller	Suitable Chiller/re-circulator to be provided
14	Hydride Vapor Generator	System should be offered with Hydride/vapor generation kit
15	Warranty	Minimum Three years from date of installation
16	Application Note	Published application note for detection limits data should be attached.

17	Other Accessories to be quoted and supplied along with machine / equipment	<p>Bidder should provide</p> <ol style="list-style-type: none"> 1.Argon gas cylinders (02 no`s) with double stage regulator, Nitrogen gas cylinders (02 no`s) with double stage regulator 2.Gas Purification System, Manifold for 2 cylinders spares and consumables for 2 year operation as required 3. system with Latest PC – i5 (Dell/HP//Compaq) and Printer & Suitable online 15 KVA UPS with 60 minutes power backup to run the complete ICP system including chiller.
18	Calibration standards	<ol style="list-style-type: none"> 1.1000 ppm of Each Zinc,Cu,Ni,Cd,Pb,Hg,Cr,Mo,Se,As,Co,As, Hg, Au, Antimony,Barium, Selenium, Iron, Lithium, Manganese Single Element Standard 100ml quantity with NIST traceability 2.1000 ppm of Multielement standard containing of minimum 60 elements to be provided.
19	Other terms and conditions	<ol style="list-style-type: none"> 1.Tenderer should be the manufacturer / authorized dealer. Letter of Authorization from original equipment manufacturer (OEM) specific to the tender should be enclosed. 2.Technical catalogue of the Equipment quoted along with model no. should be available at OEM website 3.An undertaking from the OEM is required stating that they would facilitate the tenderer on a regular basis with technology/product updates and extend support for the warranty as well 4.OEM should be Nationally/Internationally reputed Co 5.Non-compliance of tender terms, non-submission of required documents, lack of clarity of the specifications, contradiction between tenderer specification and supporting documents etc. may lead to rejection of the bid. 6.Submit all supporting information with respect to the technical data, drawings or booklets of product along with test certificates available may be enclosed

	7.All supplies are subject to pre delivery inspection and approval before acceptance.
	8.In the event of the ordered item failing to pass the acceptance test, a period not exceeding three weeks will be given to rectify the defects and clear the acceptance test, failing which the purchaser reserve the right to get the equipment replaced by the supplier at no extra cost to the purchaser.
	The entire system should be installed by the company professionals at oursite. A thorough technical training (minimum 5 working days) in analyzing and troubleshooting should be given by the technical professionals

Universal Testing Machine (100 KN) with extensometer and all accessories		
Sl. No.	Specification	Range / Value
1	Make & Model	To be specified by the Bidder
2	Purpose	Determination of Tensile, Flexural and Compressive Properties of Polymeric Materials including Plastics, Elastomers, Fibers / filaments / yarns, FRPs, Films/sheets, woven sacks, geomembranes, etc.
3	Reference Standards	To comply with EN 10002-2,ISO 7500-1,BS 1610,ASTM D 638,ISO 527, ASTM E4
4	Capacity	100 kN (static rating) (Make and model to be quoted)
4.1	Control System	Microprocessor controlled
5	Cross Head Speed / Test Speed	
5.1	Maximum Test Speed	≥ 500 mm/min
5.2	Minimum Test Speed	≤ 0.0005 mm/min or better
5.3	Accuracy	0.1% of set speed or better
5.4	Return Speed	500 mm/min or better speed selection should be possible
5.5	Resolution of crosshead speed	≤0.05 μm/min

5.6	Jog Speed	Provision to specify jog speed to protect samples of light materials while mounting
5.7	Maximum force at full speed	100 kN
5.8	Position control resolution	0.00005 mm or better
5.90	Position measurement resolution	0.02 μ m or better
5.10	Total crosshead travel	1200 mm or more
5.11	Total Vertical Test Space	950 mm or more
5.12	Space between columns (horizontal daylight)	550 mm or more
6	Load/Displacement reading interchangeability	
6.1	Load	N, kN, g, kg, lb
6.2	Displacement	mm, cm, inch
7	Load Measurement	Make and model of load cell to be quoted
7.1	Load Cell Capacity	100 kN - 1 no. with provision for easy attachment as required for normal test and test under environmental chamber
7.2	Accuracy	Within $\pm 0.5\%$ of indicated force
7.3	Repeatability	$\pm 0.25\%$ of reeading or 0.005% of capacity (whichever is less)
7.4	Resolution	0.0004% of capacity or less
7.5	Load Cell Calibrator	1 no. each for 100 kN to be supplied with the system
8	Strain Measurement	Make and model of extensometer to be quoted
8.1	Extensometer	Contact type extensometer for rubber sample testing at room temperature
		Vertical travel - 900 mm or better
		Resolution - 25 micrometer or better

		Accuracy - \pm 300 micrometer or better
9	Grips & Fixtures (for Tensile, Flexural, Compression, Shear as per ASTM / ISO standards for Plastics, Elastomers, Fibers, FRPs, Films) - For all load cells (100 kN, 10 kN, 1kN & 100N)	Pneumatic & Manual type wedge type grips
		Specimen thickness - 200 μ to 10mm
		Specimen length - 2 cm to 20 cm
		Specimen width - upto 5 cm
		Pneumatic grip upto 10 kN or better for films & fibers
		Compression test fixture complying to ASTM D 695
		Flexural - three point bend and four point jig fixture complying to ASTM D 5943 for specimen support up to 10 kN and adjustable span 20 mm -200 mm or equivalent
		Fixtures such as Tensile grips, mechanical wedge grips, pneumatic vice grips should suitable for low and high temperature (-70 to 200 °C) testing and can be accommodated into environmental chamber whenever required.
10	Environmental Chamber	Make and model no to be quoted
	Operation Temperature range	-70 to +200°C or better
	Accuracy	1.5°C
	Chamber Dimension	300 x 300 x 600 mm (W X D X H) or equivalent
	Cooling Medium	Liquid Nitrogen (Dewar Flask of required capacity to be provided) and required accessories
11	Machine Control	An integrated control system and measuring electronics with dedicated Graphical UI application software to performing the tests
12	Measuring Electronics	A computerized Data Acquisition Electronics with signal conditioning amplifiers with sufficient bandwidth for measurement of Load and Strain, Cross head position with integrated application software

13	Data Acquisition Sampling Rate	3000 HZ or equivalent
14	Analog Output	Shall have analog output to connect to external recorder corresponding to measured Load, Extensometer at $\pm 10V$ Full Scale
15	Remote Control	Shall be provided to move the Cross head, Grippers, Emergency Stop etc.
16	Control Mode	Make and model of Testing software to be provided
		a. Load control.
		b. Strain control.
		c. Stress-control.
		d. Speed control.
e. Position Control		
17	Test Mode	Tensile test
		Compression test
		Flexural tests
18	Methods	Should be able to create variety of test methods as per the popular ASTM and ISO standard and also capable of creating customized test setups
19	Graph Display on screen	Must be able to plot/display real time online illustrative graph on display screen for
		a. Load Vs Displacement (i.e. Crosshead)
		b. Load Vs Extension (from extensometer)
		c. Load Vs Time.
		d. Stress Vs Strain.
		e. Displacement Vs Time.
f. Strain Vs time		
		Machine must be able to measure & record following parameters, in SI units
		Ultimate Tensile Load (kN, N, kg)

20	Data measurement and storage	Breaking Load	
		Yield Load	
		Cross sectional area (mm^2 , cm^2 , m^2)	
		Ultimate Tensile Strength (MPa, N/cm^2 , N/m^2)	
		Yield Stress	
		Proof Stress	
		Gauge Length (mm, cm, m)	
		Elongation at specified load (%)	
		Load at specified elongation or travel length (N / kN / kg)	
		Elongation (%)	
		Modulus of Elasticity	
		After Test, data sheet and graph should automatically stored in defined folder (data sheet in excel and pdf format, Graph in JPEG, bitmap, pdf etc) apart from software	
		21	Area Calculation
		The software must have three level of user access based on login name and password protection.	
		Required number of live display window shall be available for display simultaneously.	
		The software shall allow the user to define significant digits or decimal places for all live displays.	
		Software shall have auto scaling plots.	
		The software shall allow for recording of a test with a USB camera device (such as a webcam).	
		The software shall allow for result to display in the live display after test.	

22	Software and its additional Specification	<p>The software shall allow for peak, modulus of elasticity and yield calculation to be evaluated real-time during the test and displayed in the live displays.</p> <p>Machine - Controller Interface through USB High Speed Data Transfer rate of 1 kHz or better</p> <p>Software should have calculation of key test results such as Peak values, Break values, UTL, UTS, Young's Modulus, Yield stress and strain, 0.2% Proof stress and strain, Area under the curve, loads @ specified elongations, elongations @ specified loads etc.</p> <p>Software should have automatic printable view of Graph and Report with Statistical Analysis such as Mean, Min, Max, Std Deviation etc. for multi specimen testing.</p> <p>Raw test data should be accessible in Microsoft Spread Sheet program ex: MS Excel.</p> <p>It should store test data and results to hard disk in ASCII delimited format for easy import into popular Spread-sheet and database programs.</p> <p>Software must be perpetual with all latest advance modules.</p>
23	Computer and printer	<p>Standard latest computer system with updated configuration (Windows 10 OS or better) compatible with the current as well as the upgraded software version along with colour printer and all other requisite accessories</p>
24	Control panel for manual operation	<p>The UTM Should be operable in Manual mode in case the entire computer/software crashes. The system should be connected to a printer / recorder in such case and stress/strain graph or load/elongation shall be recorded.</p>

25	Mandatory Standard Accessories to be provided along with the machine	<p>All necessary grips and fixtures for for all tests for plastics/Polymer materials along with model no. to be provided -</p> <ol style="list-style-type: none"> 1. Tensile, 2. Compression, 3. 3 Point Bending, 4. 90° Peel tester for adhesive tapes 5. Fixture for testing of friction of plastics films <p>All grips shall comply to IS / ASTM / ISO standards for Plastics, Elastomers, FRPs and filaments / Yarns. (Bidder should specify and quote for any other accessories required / available for better usage of machine as optional) .</p>
26	Spares	<p>The manufacturer shall recommend along with the price, list of the spare parts sufficient for a period of two years trouble-free operation of complete system on continuous two-shift per day basis. The supplier shall submit the quotation with all the requisite technical literature, substantially describing the features of the system.</p>
27	Acceptance Criteria	<p>The Supplier should be original equipment manufacturer (OEM) or Authorized Representative. In case of authorized representative letter of authorization from OEM shall be submitted.</p> <p>Minimum 5 nos of similar equipment should be supplied in India to Govt. Institutes or R&D Organizations or reputed Industries. Performance certificate from the institution / organization on present date to be provided.</p> <p>Factory Trained Personnel should be available in India for post sales services.</p> <p>Pre-dispatch inspection of the system shall be carried out at the time of final assembly and testing in the presence of purchaser's representatives, at supplier's place or mutually agreed between the supplier and purchaser</p> <p>Equipment model no. as quoted should be available in the OEM website and bidder should ready to make demonstration of the equipment and inspection of the same before a technical evaluation if required.</p>

		The supplier shall agree to carry out any modifications in the system, free of cost, as suggested by Purchaser's Inspector during Inspection/Training at Supplier's works, for meeting the overall scope of requirement and performance of the system.
28	Scope of Supply / Bill of Material	Bidder should submit Scope of Supply / Bill of Material with make model of each items.
29	Warranty	2 years from the date of installation
30	Other terms and conditions	1.Tenderer should be the manufacturer / authorized dealer. Letter of Authorization from original equipment manufacturer (OEM) specific to the tender should be enclosed.
		2.Technical catalogue of the Equipment quoted along with model no. should be available at OEM website
		3.An undertaking from the OEM is required stating that they would facilitate the tenderer on a regular basis with technology/product updates and extend support for the warranty as well
		4.OEM should be Nationally/Internationally reputed Company.
		5.Non-compliance of tender terms, non-submission of required documents, lack of clarity of the specifications, contradictio between tenderer specification and supporting documents etc. may lead to rejection of the bid.
		6.Submit all supporting information with respect to the technical data, drawings or booklets of product along with test certificates available may be enclosed
		7.All supplies are subject to pre delivery inspection and approval before acceptance.
		8.In the event of the ordered item failing to pass the acceptance test, a period not exceeding three weeks will be given to rectify the defects and clear the acceptance test, failing which the purchaser reserve the right to get the equipment replaced by the supplier at no extra cost to the purchaser.

9.The entire system should be installed by the company professionals at oursite. A thorough technical training (minimum 5 working days) in analyzing and troubleshooting should be given by the technical professionals

Computerized Universal Testing Machine (50 kN) with Electronic Extensometer and all Accessories (New)

Sl. No.	Specification	Range / Value
1	Make & Model	To be specified by the Bidder
2	Purpose	Determination of Tensile, Flexural, Compressive and Shear Properties of Polymeric Materials including Plastics, Elastomers, Fibers / filaments / yarns, FRPs, Films/sheets, woven sacks, geomembranes, etc.
3	Reference Standards	IS / ASTM / ISO Standards relevant to Plastics, Elastomers, Fibers, FRPs, Films / Sheets / Woven sacks / Geomembranes etc.
4	Capacity	50 kN (static rating)
4.1	Control System	Microprocessor controlled
5	Cross Head Speed / Test Speed	
5.1	Maximum Test Speed	≥ 500 mm/min
5.2	Minimum Test Speed	≤ 0.0005 mm/min or better
5.3	Accuracy	0.1% of set speed or better
5.4	Return Speed	950 mm/min or better speed selection should be possible
5.5	Resolution of crosshead speed	0.05 mm/min
5.6	Jog Speed	Provision to specify jog speed to protect samples of light materials while mounting
5.7	Maximum force at full speed	50 kN
5.8	Position control resolution	0.00005 mm or better
5.90	Position measurement resolution	0.02 μm or better

5.10	Total crosshead travel	980 mm or better
5.11	Total Vertical Test Space	1200 mm or more
5.12	Space between columns (horizontal daylight)	550 mm or more
6	Load/Displacement reading interchangeability	
6.1	Load	N, kN, g, kg, lb
6.2	Displacement	mm, cm, inch
7	Load Measurement	
7.1	Load Cell Capacity	50 kN - 1 no., 10 kN 1 kN - 1 no. with provision for easy attachment when required
7.2	Accuracy	± 0.5% of reading or 0.01% of capacity (whichever is less)
7.3	Repeatability	± 0.25% of reeading or 0.005% of capacity (whichever is less)
7.4	Resolution	0.0004% of capacity or less
7.5	Load Cell Calibrator	1 no. each for 50 kN, 10 kN & 1 kN to be supplied with the system
8	Strain Measurement	
8.1	Extensometer	Fully Auto contact type extensometer
		Capable for use under ambient conditios as well as elevated and sub zero temperature inside environmental chamber
		Vertical travel - 560 mm or better
		Resolution - 0.25 mm or better
		Accuracy - 1% on 25 mm & 50 mm gauge length
		Pneumatic & Manual
		Specimen thickness - 200 μ to 10mm
		Specimen length - 2 cm to 20 cm
		Specimen width - upto 5 cm
		Pneumatic grip upto 10 kN or better for films & fibers
		Surface Hardness HRC60

9	Grips & Fixtures (for Tensile, Flexural, Compression, Shear as per ASTM / ISO standards for Plastics, Elastomers, Fibers, FRPs, Films) -For all load cells (50 kN, & 1KN)	Grips for Rigid plastics (self lock wrench grip, opening up to 7mm), plastic/composite rod (upto 0-7 mm dia) woven sacks (50 mm width), rubber, fibre/filament.
		Warp grips suitable for seat belts or similar samples
		Compression test fixture with 100mm dia
		Fixtures for 90° peel width 1kN capacity for Adhesive Taper
		Flexural - three point bend and four point jig fixture complying to ASTM D 5943 for specimen support up to 10 kN and adjustable span 10 mm -300 mm or equivalent
		Fixtures such as Tensile grips, mechanical wedge grips, roller grips, pneumatic vice grips should be suitable for low and high temperature testing and can be accommodated into environmental chamber upgradable to whenever required
10	Machine Control	An integrated control system and measuring electronics with dedicated Graphical UI application software to performing the tests
11	Measuring Electronics	A computerized Data Acquisition Electronics with signal conditioning amplifiers with sufficient bandwidth for measurement of Load and Strain, Cross head position with integrated application software
12	Data Acquisition Sampling Rate	Min 3000 Hz
13	Analog Output	Shall have analog output to connect to external recorder corresponding to measured Load, Extensometer at $\pm 10V$ Full Scale
14	Remote Control (Touch Screen)	Shall be provided to move the Cross head, Grippers, Emergency Stop etc.
15	Control mode	The test controller should operate in
		a. Load control.
		b. Strain control.
		c. Stress-control.
		d. Speed control.
		e. Position Control

16	Test Mode	Tensile test
		Compression test
		Flexural tests
		Shear tests
17	Methods	Should be able to create variety of test methods as per the popular ASTM and ISO standard and also capable of creating customized test setups
18	Graph Display on screen	Must be able to plot/display real time online illustrative graph on display screen for
		a. Load Vs Displacement (i.e. Crosshead)
		b. Load Vs Extension (from extensometer)
		c. Load Vs Time.
		d. Stress Vs Strain.
		e. Displacement Vs Time.
f. Strain Vs time		
19	Data measurement and storage	Machine must be able to measure & record following parameters, in SI units
		Ultimate Tensile Load (kN, N, kg)
		Breaking Load
		Yield Load
		Cross sectional area (mm^2 , cm^2 , m^2)
		Ultimate Tensile Strength (MPa , N/cm^2 , N/m^2)
		Yield Stress
		Proof Stress
		Gauge Length (mm, cm, m)
		Elongation at specified load (%)

		Load at specified elongation or travel length (N / kN / kg)
		Elongation (%)
		Modulus of Elasticity
		After Test, data sheet and graph should automatically stored in defined folder (data sheet in excel and pdf format, Graph in JPEG, bitmap, pdf etc) apart from software
20	Software and its additional Specification	The software must have password protection.
		Required number of live display window shall be available for display simultaneously.
		The software shall allow the user to define significant digits or decimal places for all live displays.
		Software shall have auto scaling plots.
		The software shall allow for result to display in the live display after test.
		The software shall allow for peak, modulus of elasticity and yield calculation to be evaluated real-time during the test and displayed in the live displays.
		Machine - Controller Interface through USB/LAN High Speed Data Transfer rate of 3 kHz or better
		Software to be able to perform cyclic tests and Segmented Control profiles under position, load and strain control modes
		Software should have calculation of key test results such as Peak values, Break values, UTL, UTS, Young's Modulus, Yield stress and strain, 0.2% Proof stress and strain, Area under the curve, loads @ specified elongations, elongations @ specified loads etc.
		Software should have automatic printable view of Graph and Report with Statistical Analysis such as Mean, Min, Max, Std Deviation etc. for multi specimen testing.

		Raw test data should be accessible in Microsoft Spread Sheet program ex: MS Excel.
		It should store test data and results to hard disk with suitable format for easy import into popular Spreadsheet and database programs.
		Software must be perpetual with all latest advance modules.
21	Computer and printer	Standard latest computer system with updated configuration (Windows 10 OS or better) compatible with the current as well as the upgraded software version along with colour printer to be provided.
	UPS	UPS with 10 KVA for equipment to be supplied
22	Control panel for manual operation	The UTM Should be operable in Manual mode in case the entire computer/software crashes. The system should be connected to a printer / recorder in such case and stress/strain graph or load/elongation shall be recorded.
23	Mandatory Standard Accessories to be provided along with the machine	All necessary grips and fixtures for all load cells for all tests - Tensile, Compression, 3 - Point Bend, Peel All grips shall comply to IS / ASTM / ISO standards for Plastics, Elastomers, FRPs and filaments / Yarns. Bidder should specify and quote for any other accessories required / available for better usage of machine.
24	Other Conditions	Equipment to be calibrated for force and extensometer as per ASTM / ISO standards for Plastics, Elastomers and FRPs Calibration certificate - NIST Traceable or from an NABL Accredited Laboratory should be provided
25	Spares	The manufacturer shall recommend along with the price, list of the spare parts sufficient for a period of two years trouble-free operation of complete system on continuous two-shift per day basis. The supplier shall submit the quotation with all the requisite technical literature, substantially describing the features of the system.

26	Acceptance Criteria	The Supplier should be original equipment manufacturer (OEM) or Authorized Representative. In case of authorized representative letter of authorization from OEM shall be submitted.
		Similar equipment should be supplied in India to Govt. Institutes or R&D Organizations or reputed Industries
		Factory Trained Personnel should be available in India for post sales services.
		Pre-dispatch inspection of the system shall be carried out at the time of final assembly and testing in the presence of purchaser's representatives, at supplier's place
		The supplier shall agree to carry out any modifications in the system, free of cost, as suggested by Purchaser's Inspector during Inspection/Training at Supplier's works, for meeting the overall scope of requirement and performance of the system.
27	Scope of Supply / Bill of Material	Bidder should submit Scope of Supply / Bill of Material with make model of each items.
28	Warranty	2 years from the date of installation

HYDROSTATIC PRESSURE TESTER		
Sl. No.	Specification	Range / Value
1	Pressure Range	100 bar
2	Resolution	0.01 bar
3	Number of Station	05 Station with 3 outlet each station
4	Pressure transducers	30 bar- 01 no., 60 bar- 02 nos., 100 bar - 02 nos.
5	Accuracy class for pressure transducer	0.25% of full scale of pressure transducer or better

6	Features	<p>The machine and the computer should display the time, pressure and all testing conditions</p> <ul style="list-style-type: none"> Quick connected couplings for connecting test samples Integrated high-pressure pump Pressure regulation via microprocessor controller System Controller with two-line LCD display Overtemperature shutdown Interface for chiller/heat exchanger Pressure Transducers of suitable capacity as mentioned above. Automatic Temperature controller interfacing with Water bath Data interface to internal programs via PC <p>The machine should observe, analysis, inquire, save, print, testing Curve(pressure-time) and starting time, setting time, current time, valid time, invalid time, remaining time, over pressure time, pressure compensating time and etc.</p>
7	Accessories	Stainless steel pressure reservoir (Material of good construction (to be declared by vendor)
8	End fittings: shall be provided with good quality gaskets and pressure release valves)	<ul style="list-style-type: none"> • End fittings (As per IS 4984) Size : 16, 20, 25, 32, 40, 50, 63, 75, 90, 110, 125, 140,160, 180, 200, 225, 250, 280, 315 (1set each) • End Fittings (As per IS 4985) Size : 20, 25, 32, 40, 50, 63, 75, 90, 110, 125, 140, 160,180, 200, 225, 250, 280, 315 (1set each) • 10 Nos. of durable hoses shall be provided with quick fitting/ release on connection with pressure stations.
Technical Specification of Water Tank -02 Nos		
1	Water temperature range of Tank	From Ambient to (+)100°C
2	The Temperature Controlling Accuracy of test tank	±1.0°C
3	Temperature Regulating accuracy	±0.1°C

4	Tank Type	02 Nos of Tank of best quality material with an Inner Size suitable to accommodate Minimum 06 Nos of test samples of 400mm Dia Pipe for pressure testing. Water tank shall be fabricated with SS 304 Inner & outer side (rust free). It shall be provided with thick glass wool insulation to maintain the temperature. water tank shall have two lids fixed with hinges at top with provisions to insert pipes with hoses inside the water bath and having drain with valve. (Approx. Size 1.2 x 2.0 x 1.2 mtr) (L x W x H)
5	The Working Time of the Timer	0-9999 h or better
6	Timer Display Accuracy	1 Sec
7	Features	<p>Auto monitoring of water level & Circultaion System</p> <p>Automatic top-up</p> <p>Integrated heaters</p> <p>Connection and interface for chiller/heat exchanger</p> <p>Automatic Temperature controller with digital temp and time display</p> <p>Data interface to internal programs via PC</p>
8	Other Mandatory Items	<p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> • Hard copies of Operational & Service Manual- 01 set • Calibration Certificate with traceability for required parameters like temperature & timer. • Machine should come with all other essential accessories & spares required for installation, commissioning & Operation.

UV weathero meter		
Sl. No.	Specification	Range / Value
1	Applications	To simulate, accelerate and correlate the artificial sunlight / weathering atmosphere for polymers, coatings, etc.
2	Effective radiation area	4000 cm ²
3	Components surface temperature	45°C to 80°C for UV Cycle
4		45°C - 60°C for Condensation
5	Temperature accuracy	± 0.1°C or better
6	Temperature resolution	1°C or better

7	Temperature controller	Black Panel Temperature
8	Centre distance of lamp	5 cm or better
9	Humidity	upto 100%
10	Light source	UV-B Fluorescent Lamp
11	Wavelength	UVB (313 nm)
12	Minimum sample holder plates	Aluminum Plates 24 sample holders
13	Conditioning cycle	Light cycle and Condensation cycle
14	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
15	Conforms to standards	ASTM G151, ASTM G 154, ISO 4892 (1 – 3), SAE J2020
16	Warranty	Minimum 2 years of warranty to be provided
17	Scope of supply	Complete list of items quoted are to be provided
18	Installation requirements	Bidder to specify the preinstallation requirements
19	Training	Onsite training for system operation and maintenance as well as application support should be provided by the vendor at its own cost.
20	Service	Appropriate tool box/kit for routine maintenance should be provided with the equipment
		All documents (i.e. operating & service manuals, drawings etc.) and original softwares relevant to the instrument and its accessories must be supplied.
		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.
		Power and receptacle/socket as per Indian Standards should be provided.
		The vendor shall have local service and application office and infrastructure to attend by visit within 48 hours of need.
		The vendor should have technical support in the area of application and service available within the country

Modulated Differential Scanning Calorimetry (MDSC)

Sl. No.	Specification	Range / Value
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1	Purpose	Measurement of the following properties of polymers, rubbers, elastomers etc
		· Measures heat absorbed or released by a sample as a function of time, temperature and environment
		· Glass transition temperature (T_g)
		· Melting temperature (T_m),
		· Crystallization temperature (T_c)
		· % of crystallinity,
		· Curing temperature
		· Degree of cure
		· Purity
		· Activation energy
		· Heat of enthalpy
		· Heat of fusion
		· Kinetic studies (isothermal/non-isothermal)
		· Thermal stability
· Oxidation/decomposition		
· Oxidative-Induction Time (OIT)		
· Specific Heat		
2	Principle/Definition	MDSC is a thermo-analytical technique to investigate the response of polymers to heating cycle.
3	Reference Standard	ASTM D 3417-99, ASTM D 3418-15, ASTM E 1356-08(2014), ISO 11357-1:2016, ASTM-D 3895-14
4	System	System shall be capable of running in conventional DSC mode as well as Sine wave modulated DSC mode
5	Temperature Range	-150 °C to 700°C
6	Temperature Accuracy	± 0.1C or better
7	Temperature Precision	± 0.05°C or better
8	Heating/Cooling Rate	0.01 °C/min to 100°C/ min or higher
9	Oscillating (modulated) heating rate	± 1.0 °C/min. Or better
10	Furnace	To be constructed of corrosion resistant material suitable for rapid heating/cooling and should have long lifetime.
11	Calorimeter Sensor	Thermopile or constantan or platinum Thermocouple

12	Calorimeter Baseline Repeatability / Stability/ Flatness	<30 μ W or better
13	Maximum Calorimetric Sensitivity	0.2 μ W or better
14	Calorimetric Precision (based on metal standard)	\pm 0.10% or better
15	Dynamic Range	\pm 200 mw to 500 μ W
16	Temperature Calibration	5 points calibration over the full temperature range
17	Baseline Noise (max. peak to peak)	0.1 μ W or better
18	Software	<ul style="list-style-type: none"> · Operating software and analysis software shall be user friendly and shall be running on windows 7/10 version <hr/> <ul style="list-style-type: none"> · Analysis software shall have the provision to smoothen to evaluate peak temperature, onset temperature, glass transition temperature, melting temperature, Vendors should offer all major software as above with offer.crystallization temperature % of crystallinity, purity, curing temperature, activation energy, heat of enthalpy, heat of fusion, kinetic studies, Oxidative-Induction Time (OIT), X-scaling w.r.t time, temperature, etc. <hr/> <ul style="list-style-type: none"> · The software shall have the provision to view total heat flow, modulated heat flow, total heat capacity signals in real time during experiment. <hr/> <ul style="list-style-type: none"> · Software for kinetic studies (to be supplied with one licence as the same can be used with TGA) for single and multiple steps through non-linear regression <hr/> <ul style="list-style-type: none"> · The data analysis software should be unkeyed or multi-user licensed to allow installation at minimum 3 PCs Calibrations shall include baseline, cell constant and temperature. Scheduling capabilities must be present, such that these calibrations and/or verifications can be programmed to perform during normal quiescent periods, such as overnight or on weekends. <hr/> <ul style="list-style-type: none"> · The data file format should easily allow sharing/transfer of data files as individual electronic documents, which are readable by the same data analysis package. <hr/> <ul style="list-style-type: none"> · The operating software should also be capable of periodically and automatically checking for updates via an Internet connection, and downloading/installing those updates if desired. <hr/> <p>Library,</p>

		Compatible to Windows 7 or higher OS (32 and 64 bit) and should have the capabilities to heating rate, temperature setting, etc. and capable of collecting data on heat flow, heat capacity enthalpy change, Cp, Tg, Tm, Tc, peak area, peak onset, etc.
19	Measurement Atmosphere	N ₂ or O ₂ or air
20	Provision for cooling	Fully automatic Inbuilt liquid nitrogen cooling system & accessories with variable cooling rates as specified above.
21	Control system	Built in Gas mass flow control system with auto gas switching option within the test run.
22	Accessories	DSC shall include:
		· 01 no. of Platinum pan with lid,
		· 01 no. of Graphite pan with lid
		· 100 nos. of Copper pans for OIT test
		· 800 nos. of Aluminium pans with lid.
		· Standard samples such as Indium, Tin, Adamantane with Traceable calibration Certificate for calibration purpose.
		· Crimper and die set to be supplied along with the Instrument for sample preparation of both dry powder and liquid samples.
		· Cooler System for -150 to 700 C range
		Liquid Nitrogen (LN ₂) system with a Dewar of 50L capacity or suitable system in order to achieve the required temperature upto -150 °C and maintain the temperature during the test duration and over all comply with the other performance requirements.
		· Gas Tubing & fittings-01Set
· Moisture dryer-01Set		
· PC of required configuration with original software		
· 01 no of filled N2 gas cylinder with two stage SS Gas regulator of best quality with tubing fittings		
· 01 no of filled O2 gas cylinder with two stage SS Gas regulator of best quality with tubing fittings.		
23	Calibration Certificate	Calibration certificates for supplied reference material traceable to NIST and internal calibration report to be provided.
24	Personal Computer (PC)	A Personal Computer having latest configuration.
		All softwares shall be loaded in the hard disk with appropriate partitions. All original CDs/DVDs must be provided

25	Others	<ul style="list-style-type: none"> · Modulated DSC shall have the ability to apply sinusoidal temperature wave to sample by amplitude and frequency.
		<ul style="list-style-type: none"> · Modulated DSC shall include the ability to perform quasi-isothermal experiments i.e. holding isothermal with a small temperature modulation.
		<ul style="list-style-type: none"> · Modulated DSC should be able to show the following signals in real time during the experiment: Total Heat Flow, Total Heat Capacity, Reversing Heat Capacity, Reversing Heat Flow, Non-Reversing (Kinetic) Heat Flow, Modulated Temperature, Modulated Heat Flow, Heat Flow Phase, Reference Sine Angle, Temperature Amplitude, and Heat Flow Amplitude.
		<ul style="list-style-type: none"> · DSC shall allow for the direct measurement of specific heat CP i.e. in one single scan.
26	Other Mandatory Accessories	While supplying the Machines, the supplier should also provide the following items apart from above:
		<ul style="list-style-type: none"> · Basic tool Kit-01 set
		<ul style="list-style-type: none"> · Hard copies of Operational & Service Manual- 01 set
		<ul style="list-style-type: none"> · Necessary Hoses & Nipples required -01 set
		<ul style="list-style-type: none"> · The Machines should come with all other essential accessories & spares (as per ASTM & ISO standards) required for installation, commissioning & operation.