

**Technical Specification for Tender No. 2023-24/01 Released Government E - Marketing (GeM Portal)**

<b>1. High Resolution Inductively Coupled Plasma Optical Emission Spectrometer (ICP - OES)</b>		
<b>Sl. No.</b>	<b>Specification</b>	<b>Range / Value</b>
1	<b>Introduction</b>	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 <b>including polymers, plastic material, Soil, Waste water, Environmental, Paints, Petroleum, sediments, ceramics, materials etc</b>
		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	<b>Optical System</b>	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 <b>2-dimensional Array or suitable CCD Detector</b>
		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 <b>2 Lpm or less</b> to minimize gas consumption.
3	<b>RF Generator</b>	The Solid state water cooled RF generator must run at a frequency of 40 / 27.12 MHz .
		The generator shall have a high coupling efficiency of >75% and be directly coupled with a swing frequency impedance control and power regulation/output stability to better than 0.1%.

		RF power should be minimum 1500 watt in both axial and radial mode and variable with 10 watt or less in increment
4	<b>Plasma / Auxiliary / Nebulizer Gases</b>	Argon Gas consumption should be as low as possible.
		Preferably <b>8 -20 L/min with Mass flow controller</b> , including optics purge
		<b>Four</b> 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) <b>&amp; Makeup/organic solvent oxygen gas MFC</b> for the better optimization
5	<b>Standard Sample Introduction Kit / Peristaltic Pump</b>	Sample introduction shall be via an integral, close coupled and variable speed, peristaltic pump with a minimum of <b>10 or more roller</b> . The pump shall have preferably <b>3 or more</b> -channels to accommodate sample, drain, online internal standard and hydride generation line all together.
		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 or as per the <b>suitable flow rate to comply</b> .
		A semi demountable quartz ICP torch with separate injector shall be provided for maximum flexibility.
		The torch orientation should be horizontal and plasma shall be viewed axially as well as radially. Auxiliary optics shall be available to provide a radial plasma view.

6	<b>Plasma Viewing</b>	<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	<b>Resolution</b>	<p>The instrument shall have the capability to perform measurements in routine operation with a Minimum optical resolution of 0.009 @200nm nanometer or better.</p>
8	<b>Wavelength Range</b>	<p>The instrument shall be able to operate over the minimum range of 166 to 750 nm or suitable range to cover all element.</p>
9	<b>Detector</b>	<p>The instrument shall be equipped with solid state CCD/CID Detector <b>with <math>\leq 1</math> second or equivalent integration/readout time</b></p> <p>The Detector shall be maintained at low temperature and should be able to attain the required <b>temp within 30 min from standby mode</b> and background noise resulting in enhanced detection limits.</p>
10	<b>Detector Operating Modes.</b>	<p>The detector must be capable of measuring all the analytes in the single analysis with wide linear dynamic range.</p>
		<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>

11	<b>Software</b>	<p>Full instrument control with the ability to display parameters and instrument response in real time.</p> <p>Fully automated system start up and shutdown via the instrument control window.</p> <p>Real time graphics for instrument setup and monitoring.</p> <p>All set up parameters including plasma position to be stored on disk.</p> <p>Internal diagnostics including error checking and complete fault log.</p> <p>Automatic identification of possible spectral interferences when selecting wavelengths for analysis. Search mode for identification of unknown wavelengths should be available</p> <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>Vendor should provide Microwave Digestion System for <b>12</b> or more reaction vessels simultaneously <b>with pressure OR temperature monitoring</b>. Make and model no. to be quoted</p> <p>Applications : For acid digestion applications of samples like <b>plastics, polymers, rubbers, water, wastewater, soil, sludge, environmental, Sediments samples, natural products, plant materials, etc. for further</b> analysis with AAS, ICP – OES or ICP – MS techniques.</p>

12

**Microwave Digestion System**

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

Microwave Power : Delivered power: **1800 watts or more with dual magnetron**

**Controller :color touchscreen display (External/Internal) with real-time graphical representation of reaction parameters and display of internal temperature .**

Rotor: System should be offered with rotor of minimum 12 position or more with 12 vessels

Rotor Stability: Rotor should be made of **lightweight AL or PTFE/TFM suitable material for high pressure strength to ensure ultrafast cooling.**

Vessel material: PTFE- TFM

**Vessel volume: Up to 70 ml or more** with suitable Headspace

Minimum filling volume : 3-8 ml

Max operating temperature: 250 °C or more

Max operating pressure: 40 bar or more

Maximum temperature: 250°C or more

Maximum vessel pressure : **50 bar or more**

Sample weight: Minimum 1.5 gms or higher per vessels

Vessel safety: Closure of the vessel must be possible by hand or suitable arrangement 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 or suitable mechanism

Temperature calibrator: **A temperature calibrator or IR sensor** for accurate temperature measurement must be supplied along with the instrument with minimum 3 years validity

		<p>Cooling: Instrument should have built in exhaust for cooling the vessels inside the oven from 180 °C to 70°C in within <b>30 min.</b> Documentary evidence to be provided.</p>
		<p>Micro sample facility: Instrument should be offered <b>with glass or suitable inserts (6 or more)</b> for digestion</p>
13	<b>Chiller</b>	Suitable Chiller/re-circulator to be provided
14	<b>Hydride Vapor Generator</b>	System should be offered with Hydride/vapor generation kit
15	<b>Warranty</b>	Minimum Three year from date of installation for the supplied equipment
16	<b>Application Note</b>	Published application note for detection limits data should be attached.
17	<b>Other Accessories to be quoted and supplied along with machine / equipment</b>	<p>Bidder should provide</p> <ol style="list-style-type: none"> <li>1.4.Argon gas cylinders (04 no`s) with double stage regulator with manifold,</li> <li>2. Nitrogen gas cylinders (02 no`s) with double stage regulator along with Manifold.</li> <li>3.01 no Oxygen cylinder for Organic kit (Petroleum products) with software-controlled Mass flow controller.</li> <li>4.All gas cylinder to be provided with Gas Purification System, Manifold and locked cylinder storage shed setup of 10 nos for safety storage at preferred site.</li> <li>5.system with Latest PC – i5 (Dell/HP//Compaq) and laser Printer</li> <li>6.Suitable online 20 KVA UPS with 60 minutes power backup along with compact rack, In &amp; Out MCB, 80 Meter cable to run the complete ICP</li> <li>7. Suitable chiller for ICP &amp; Microwave Digestor etc</li> <li>8.Additional Consumables : standard Tubings p/12 (03 set each) for Sample ,ISTD and Drain; Standard torch 02 Nos;, Standard nebulizer-01;Standard Spray Chamber-01 Nos, Autosampler vessel -1000 Nos, Pre Optics widows -01 Set (Axial &amp; radial View);</li> </ol>

18	Calibration standards	<p>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 ,Phosphrus,sulfur Single Element Standard 100ml quantity with NIST traceability</p> <p>2.1000 &amp; 100ppm of Multielement standard containing of minimum 23 elements to be provided (125 ml each)</p> <p>3) Internal Standard mix for Aqueous samples :250ml</p> <p>4) Organo mantellic 23 elements mix standard 500ppm (100gm).</p> <p>5) Solvent blank for organometallic standards :3L</p> <p>6) Internal Standard single element for organo metallic -10gm</p> <p>7) Suprapure/ICPMS Grade : 2.5L Nitric Acid,2.5L HCL,1L HF &amp; 1L H2O2</p> <p>8) All solvents /chemicals for 100 Nos hydride element analysis ( each As,Hg &amp; Se) in water samples.</p> <p>9) Hydride Accessories must be supplied with separate Spray chamber</p> <p>10) Semi volatile organic kit with dedicated spray chamber,Nebulizer,Torch,tubing set &amp; Oxygen Mass flow controller</p> <p>11) HF/Inert kit with dedicated spray chamber,Nebulizer,Torch,tubing set.</p> <p>12) 200 vial autosampler with enclosure &amp; Exhaust duct for removing toxic fumes.</p> <p>13) Suitable antivibration table to be provided</p> <p>14) Basic labware's for sample preparation i.e.Three Nos different size variable volume Micropipette with 1000 tips each, three different size beakers-5 Nos each, Wartman filter paper -Pk/100;conical flask three different size -05 Nos each. Sonicator 5 L or more.</p>
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2. Limiting Oxygen Index (LOI) Tester		
Sl. No.	Specification	Range / Value
1	Make / Model	Bidder to specify
2	Purpose	To measure the minimum concentration of oxygen that will support combustion of Polymers, Rubbers, Fibers, Films, FRP products, Composites & allied Products
3	Applicable standard	ASTM D2863, ISO 4589-2

4	Digital Read out for oxygen concentration <b>Resolution</b>	±0.1% or equiv.
5	Test Chimmney	<p>Made of heat resistant glass tube of inside diameter of 75 – 100 mm, and 400 – 500 mm height.</p> <p>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.</p> <p>A lid of 40 mm diameter to the glass tube at the level at least 10 mm above the top of the cylindrical chimney.</p> <p>A gauze / wire screen making partition between combustible medium and tube to catch the falling fragments and keep the column clean.</p>
6	Specimen holder	<p>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).</p> <p>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.</p>
7	Gas measuring and controlling devices	<p>Capable of controlling the gas velocity through the chimney is <math>40 \pm 2</math> mm/s</p> <p>Calibrated pressure regulators and pressure gauges to be provided on the individual gas supply lines</p> <p>Needle valves and calibrated flow meters to be provided individually for each gas lines</p>



8	Timer	capable of measuring time with an accuracy of $\pm 0.5$ 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
		Touch screen control, user-friendly operation
		Mass flowmeter to controls the flow of oxygen and nitrogen, improving the mixing accuracy
		Display: flow rate, elapsed time
		Uniform combustion atmosphere
		Dual inlet gas pressure gauges, 0-100 psi
		Ignition wand with variable gas control valve
		Smoke density measurement system with chart recorder
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) of capacity 47 L along with IS certified regulator, Screw type rench and safety guard
		Machine should come with all other essential accessories & spares required for independent 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	<b>Warranty</b>	Minimum Two years from date of installation

3. 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 (for reflectance and transmittance), Repeatability-0.04

7	Detector	Silicon Photodiode array
8	Aperture Plates	Measurement area/ Illumination Area LAV: $\Phi$ 25.4 mm / $\Phi$ 30 mm LMAV: $\Phi$ 16 mm / $\Phi$ 20 mm MAV: $\Phi$ 8 mm / $\Phi$ 11 mm SAV: $\Phi$ 4 mm / $\Phi$ 7 mm
		Aperture detection to be provided
		Measurement area/ Illumination Area LAV: $\Phi$ 25.4 mm / $\Phi$ 30 mm
9	Lens switching for LAV/SAV	Automatic by software
10	Wavelength Range	360 - 700 nm or better
11	Resolution	Less than 10 nm
12	Reporting interval	10 nm equivalent triangular
13	Photometric range	0 -150% or more
14	Photometric Resolution	0.01%
15	Lamp and Lamp life	1 billion flashes or better
16	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:	<p>Calibrated white UV Fluorescent Standard with NIST Traceable certificate of calibration - 01no</p> <p>Sample Cup Opaque Cover - 01 no</p> <p>Glass Sample Cup (2.5in) - 04 nos.</p> <p>Port insert, 2.5in Glass sample cup holder-01no</p> <p>Sample Clamp Assembly - 01 no</p> <p>Other parts like cable, adopter, power cord to be provided</p> <p>Black Calibration light Trap</p> <p>Operation manual</p>
21	Color matching software to measure: L, a, b, $\Delta xyz$	Suitable advanced software inbuilt with instrument to analyse L, a, b, $\Delta E$ , yellowness index, grey scale rating, etc. Software must be perpetual with all latest advance modules.
22	Other Mandatory Accessories to be quoted and supplied along	<p>While supplying the Machine, the supplier should also provide the following items apart from above:</p> <p>Branded PC of best configuration with necessary software including software for colour matching &amp; suitable for the instrument operation and colour printer to be provided</p> <p>Power cable</p> <p>Hard copies of Operational &amp; Service Manual(Hard copies of Operational &amp; Service Manual- 01 set and certified reference material.)- 01 set and certified reference material.</p>

	<p>with machine / equipment</p>	<p>Machine should come with all other essential accessories &amp; spares (as per IS, ASTM &amp; ISO standards) required for installation, commissioning &amp; 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 2-year warranty</p> <p>Calibration certificate (Machine,white tile) traceable to NIST should be provided</p>
23	Scope of Supply / Bill of Material	Bidder should submit Scope of Supply / Bill of Material with make model of each items.
24	Technical Support and Service	<ol style="list-style-type: none"> <li>1. The Supplier Shall be responsible for carrying out the installation and Commissioning at customer site.</li> <li>2. Machine Should come with all other essential accessories &amp; spares required for installation, commissioning &amp; operation.</li> </ol>
		<ol style="list-style-type: none"> <li>1.Tenderer should be the manufacturer / authorized dealer. Letter of Authorization from original equipment manufacturer (OEM) specific to the tender should be enclosed.</li> <li>2.Technical catalogue of the Equipment quoted along with model no. should be available at OEM website</li> <li>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</li> <li>4.OEM should be Nationally/Internationally reputed Company.</li> </ol>

25	<b>Other terms and conditions</b>	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	<b>Warranty</b>	Minimum Two years from date of installation

<b>4. Computerized Universal Testing Machine (50 KN) with Electronic Extensometer and all Accessories (New)</b>		
<b>Sl. No.</b>	<b>Specification</b>	<b>Range / Value</b>
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	<b>Capacity</b>	50 kN
4.1	Control System	Microprocessor controlled
5	<b>Cross Head Speed / Test Speed</b>	
5.1	Maximum Test Speed	$\geq 500$ mm/min
5.2	Minimum Test Speed	$\leq 0.01$ 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 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	0.01 mm or better
5.9	Position measurement resolution	0.01 mm or better
5.1	Total crosshead travel	1200 mm or more

5.11	Total Vertical Test Space	900 mm or more
5.12	Space between columns (horizontal daylight)	400 mm or more
6	<b>Load/Displacement reading interchangeability</b>	
6.1	Load	N, kN, g, kg, lb
6.2	Displacement	mm, cm, inch
7	<b>Load Measurement</b>	
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 reading or 0.005% of capacity (whichever is less)
7.4	Resolution	0.01% 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	<b>Strain Measurement</b>	
		Fully Auto contact type extensometer



8.1	Extensometer	Capable for use under ambient conditions
		Vertical travel - 700 mm or better
		Resolution - 0.01 mm or better
		Accuracy - 1% on 25 mm & 50 mm gauge length
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 )	Pneumatic & Manual
		Specimen thickness - 0 to 12 mm
		Specimen length - 2 cm to 20 cm
		Specimen width - upto 5 cm
		Pneumatic grip upto 10 kN or better for films & fibers
		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

		<p>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</p>
		<p>Fixtures such as Tensile grips, mechanical wedge grips, roller grips, pneumatic vice grips</p>
10	Machine Control	<p>An integrated control system and measuring electronics with dedicated Graphical UI application software to performing the tests</p>
11	Measuring Electronics	<p>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</p>
12	Data Acquisition Sampling Rate	<p>3000 Hz or better</p>
13	Analog Output	<p>Shall have analog output to connect to external recorder corresponding to measured Load, Extensometer at <math>\pm 10V</math> Full Scale</p>
14	Remote Control (Touch Screen)	<p>Shall be provided to move the Cross head, Grippers, Emergency Stop etc.</p>
15	Control mode	<p>The test controller should operate in</p>
		<p>a. Load control.</p>
		<p>b. Strain control.</p>
		<p>c. Stress-control.</p>
		<p>d. Speed control.</p>

		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 <sup>2</sup> , cm <sup>2</sup> , m <sup>2</sup> )
		Ultimate Tensile Strength (MPa, N/cm <sup>2</sup> , N/m <sup>2</sup> )
		Yield Stress
		Proof Stress
		Gauge Length (mm, cm, m)
		Elongation at specified load (%)
		Load at specified elongation or travel length (N / kN / kg)
		Elongation (%)

		<p>Modulus of Elasticity</p>
		<p>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</p>
20	Software and its additional Specification	<p>The software must have password protection.</p>
		<p>Required number of live display window shall be available for display simultaneously.</p>
		<p>The software shall allow the user to define significant digits or decimal places for all live displays.</p>
		<p>Software shall have auto scaling plots.</p>
		<p>The software shall allow for result to display in the live display after test.</p>
		<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/LAN High Speed Data Transfer rate of 3 kHz or better</p>
		<p>Software to be able to perform cyclic tests and Segmented Control profiles under position, load and strain control modes</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 with suitable format for easy import into popular Spread-sheet and database programs.</p> <p>Software must be perpetual with all latest advance modules.</p>
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.
22	UPS	UPS with 6 KVA or suitable capacity for 30 min backup for equipment to be supplied
23	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.
24	Mandatory Standard Accessories to be provided along with the machine	<p>All necessary grips and fixtures for all load cells for all tests - Tensile, Compression, 3 - Point Bend, Peel</p> <p>All grips shall comply to IS / ASTM / ISO standards for Plastics, Elastomers, FRPs and filaments / Yarns.</p> <p>Bidder should specify and quote for any other accessories required / available for better usage of machine.</p>
25	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

26	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.
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>Similar equipment should be supplied in India to Govt. Institutes or R&amp;D Organizations or reputed Industries</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</p> <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.</p>
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	Machine working video link	Machine working video link must be provided

**5. 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"> <li>Quick connected couplings for connecting test samples</li> <li>Integrated high-pressure pump</li> <li>Pressure regulation via microprocessor controller System Controller with two-line LCD display</li> <li>Overtemperature shutdown</li> <li>Interface for chiller/heat exchanger</li> <li>Pressure Transducers of suitable capacity as mentioned above.</li> <li>Automatic Temperature controller interfacing with Water bath</li> <li>Data interface to internal programs via PC</li> </ul> <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	End fittings ( As per IS 4984 / IS 4985) Size : 16, 20, 25, 32, 40, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200 ( 1set)



8	with good quality gaskets and pressure release valves.	15 Nos. of durable hoses shall be provided with quick fitting/release on connection with pressure stations.
<b>Technical Specification of Water Tank -01 No.</b>		
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	01 Nos of Tank of best quality material with an Inner Size suitable to accommodate Minimum 06 Nos of test samples of 315 mm 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 &amp; Circulation 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 (to be quoted along with equipment cost and to be supplied)	<p>While supplying the Machines, the supplier should also provide the following items apart from above:</p> <ul style="list-style-type: none"> <li>• Hard copies of Operational &amp; Service Manual- 01 set</li> <li>• 1 Set Spare Heaters</li> <li>• Calibration Certificate with traceability for required parameters like Pressure Gauge, Temperature &amp; Timer.</li> <li>• Machine should come with all other essential accessories &amp; spares required for installation, commissioning &amp; Operation.</li> </ul>

6. HDT/VSP TESTER		
Sl. No.	Specification	Range / Value
1	No. of Stations	3 Stations
2	Temperature Range	Ambient to 300 ° C, Temperature Measurement – at each station separately
3	Display and control	Digital, LCD and PLC control system, Equipment with the facilities to store the data for interpretation (PC with installed Software - Window based control & data acquisition software)
4	Accuracy	± 0.1° C
5	Chamber material	Stainless steel
		Jacketed bath to have cooling water circulation
6	Rate of Heating	2 ± 0.2 °C/min (HDT); 50 ± 5 °C/hr & 120 ± 10°C/hr (VICAT)
7	Load	Suitable load increments for fibre stress of 66 & 264PSI (HDT test) and 10 N & 50 N (VSP test)
8	Deflection and penetration measuring range	0.01~ 5.00 mm (digital sensing)
9	Defelction measurement technique	LVDT
10	Support span	Adjustable and detachable both for HDT & VSP test
11	Other Features	(i). Water cooling system (without external chiller) should be provided to cool the oil after every measurement. Required volume of silicone oil (heating medium) should be provided (ii). Machine should be supplied with required weights to perform both the tests. (iii). Weight lift – Manual or Automatic
12	Warranty	Minimum 2 years warranty must be provided
13	Calibration Certificate	Calibration certificate from NABL accredited lab with traceability to NIST/ Internatioanl standards for load, indenter tip and temperature shall be made available

14	Standard	ASTM D 648 & ASTM D 1525, IS 4985, other equivalent International standards.
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7. Impact Tester (Pendulum) (Izod/Charpy)		
Sl. No.	Specification	Range / Value
	The machine should offer following key features	
1	Machine Design	Microprocessor based instrument to automatically calculate and display impact energy absorbed by a specimen. It should resolve energies less than 0.03% of the capacity of the pendulum.
		With the proper selection of accessories, machine should perform Izod & Charpy tests in accordance with ASTM D256 & ISO 180 (Izod Impact) ASTM D6110 & ISO 179, IS 15801 (Charpy Impact) Easy switching between tests by choosing appropriate striking bit
2	Pendulum	Aerodynamic compound pendulum with facility to increase/decrease pendulum capacity with addition/removal of weights enabling user to change to desired capacity quickly & easily
	Display	Should offer simple machine configuration and setting test parameters through display
		Selectable energy units of J, in.lbf, ft.lbf, kgf.m, kgf.cm
		Selectable strength calculations in ft.lbf/in, J/m, kgf.m/m, KJ/m <sup>2</sup> , in.lbf/in, kgf.m/m <sup>2</sup>
		Should offer break type input options
		Should provide real time display of energy
		Simple calibration routine which should automatically calculate the Windage and Friction losses
		Facility to set Upper and Lower Limits for Energy and Strength

		Toss Correction for low energy specimens should be implemented automatically or by keypad entry
4	Technical Specifications	Basic pendulum capacity: 2.82J, with addition of weights, user should be able to change it to 25J (Standard). Pendulum shall be supplied with load set for conducting test at 15J also.
		Drop Height: 0.61m
		Impact velocity: 3.46m/s
		Power: 220V/50Hz, single phase
		Communication: should be provided for the output of test data to a serial printer or computer
5	Charpy setup	Should include charpy striker, anvils, setting gauges & supports as per ASTM D6110 & ISO 179, IS 15801
6	Izod setup	Should include Izod striker, setting gauges & supports as per ASTM D256 & ISO 180
		Notch Aligning tool for specimen Positioning
7	Add-on Weights	Various weight sets upto 25J capacity (ISO & ASTM methods)
8	Certification	Calibration/verification certificate issued by NABL accredited Laboratory / traceable to NIST

9	Other Mandatory Accessories to be quoted and supplied along with machine / equipment	<p>Automatic specimen notch cutting machine to produce notch on test specimen in accordance with ISO 179, ISO 180, ASTM D256 &amp; ASTM D6110, IS 15801 with angle measurement template with calibration traceable to NABL</p> <p>Proper safety features shall be provided.</p> <p>Dust suction system (for automatic removal of particles generated during notch preparation) and Cooling system to prevent degradation of specimen shall be provided</p>
10	Scope of Supply :	<p>Equipment with mentioned specification and calibration certificates</p> <p>Basic Equipment, Aerodynamic compound pendulum, Weights for pendulum, Izod and Charpy setup, Specimen notch cutter and other additional items required to carry out Izod and Charpy impact test as per the standard requirements.</p> <p>NIST traceable/NABL accredited calibration certificates to be supplied</p>