



**INDIAN INSTITUTE OF TECHNOLOGY BOMBAY**  
**MATERIALS MANAGEMENT DIVISION**  
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Ref. PR No. 1000051999

RFQ. No. 3000014857

**Technical Specifications for Multipoint BET Surface Area & Pore Size Analyser**

Sr. No	Item Description	Detailed Technical Specification	Technical Compliance (Yes / No)	Additional Information (if any)
1.	<b>Multipoint BET Surface Area &amp; Pore Size Analyser</b>			
1.1.	<b><u>General</u></b>	Fully automated, multi-analysis station, static volumetric gas sorption analyzer capable of analyzing from 10 <sup>-4</sup> to 0.5 or 0.999 p/p <sub>0</sub> for the determination of surface area, pore size distribution, and pore volume using a variety of coolants and adsorbates for a wide variety of sample types. The unit shall include built-in multi-sample preparation capability and be able to operate as a standalone analyzer or via PC-controlled software interface.		
1.2.	Measurement Principle	Vacuum volumetric measurement principle		
1.3.	Material construction	Must be constructed using stainless steel and Viton elastomers and allow for measurements using N <sub>2</sub> , Ar, CO <sub>2</sub> , and other non-corrosive gases		
1.4.	<b>Sample Analysis stations</b>	Instrument must include minimum 2 analysis stations		
1.5.	Dedicated saturation pressure (p <sub>0</sub> ) Cell	Must include a dedicated saturation pressure (p <sub>0</sub> ) cell ( made up of glass material, same material as of sample cell) served by its own dedicated pressure transducer for continuous p <sub>0</sub> measurements without compromising analysis stations		

<b>1.6.</b>	Helium-free operation	Must allow for helium-free operation and the use of calibrated cells for fast analysis without expending non-renewable helium or time-consuming void volume measurement		
<b>1.7.</b>	Active cryogen level control	Must allow for active cryogenic coolant level control by integrated coolant level sensor and the submerged portion of the cell must be minimized to less than 4 cm to ensure a small analysis cold zone volume and enhanced analysis sensitivity		
<b>1.8.</b>	Relative Pressure Range (p/p0):	10 <sup>-4</sup> to 0.999		
<b>1.9.</b>	Pressure Measurement Accuracy	0.1% of full-scale including precision, linearity, and hysteresis of the complete pressure measurement system		
<b>1.10.</b>	Pressure Resolution Absolute	1.2 x 10 <sup>-4</sup> Torr		
<b>1.11.</b>	Pressure Resolution Relative	1.5 x 10 <sup>-7</sup> p/p0		
<b>1.12.</b>	Surface Area Methods	BET, Langmuir, t-plot, BJH/DH, DR, DFT		
<b>1.13.</b>	Lower Specific Surface Area Limit	0.01 m <sup>2</sup> /g		
<b>1.14.</b>	Surface Area Reproducibility	2%		
<b>1.15.</b>	Pore Size Distribution	NLDFT, QSDFT, BJH/DH, MP method, DA, Monte Carlo		
<b>1.16.</b>	Pore Size Range	0.35 – 500 nm (Diameter) [0.35 to 1.1 nm with CO <sub>2</sub> ]		
<b>1.17.</b>	Pore Volume methods	α-s, t-plot, BJH/DH, DFT, DR		
<b>1.18.</b>	Minimum Pore Volume	1.2x10 <sup>-8</sup> cm <sup>3</sup>		
<b>1.19.</b>	Dewar life capacity	Dewar should be of at least 2L and should run for 40 hours in one refill		

1.20.	Adsorbates	Compatible with N2, Ar, CO2, and other non-corrosive gases. The System should have Gas ports at least Ports: 5 nos or better ; 3 Analysis, 1 Helium, 1 Degas/Backfill		
1.21.	Sample Preparation	<ol style="list-style-type: none"> <li>1. Must include 4 built-in dedicated degassing ports as an integrated component of the instrument system design in order to minimize the amount of bench space required for a complete preparation / analysis system</li> <li>2. Must permit simultaneous degassing of 4 samples, at two different temperature zones, while analysis is in progress</li> <li>3. Must allow for samples to be prepared either under vacuum conditions.</li> <li>4. At the end of vacuum degassing, backfill of samples must be supported by a dedicated backfill pressure transducer and dedicated gas line.</li> <li>5. Must allow for programmable protocols consisting of multiple heating ramps, of various rates, and multiple hold times to enable careful and systematic temperature control during sample preparation.</li> <li>6. Must allow for degassing temperatures up to 425°C.</li> <li>7. Sample preparation heaters must incorporate dual thermocouples for over-temperature protection</li> </ol>		
1.22.	Necessary Software Features	<ol style="list-style-type: none"> <li>1. Must include no less than 20 pre-loaded analysis profiles suitable for analysis.</li> <li>2. Must allow for custom and fast dosing profiles using a wide variety of techniques, including by target p/p0, by target dose volume, by reference to dose template from previous analysis, and by automatic addition of measurement points based on adsorbed volume differences between requested points.</li> <li>3. Must offer flexible saturation pressure (p0) options including allowing for the p0 to be manually entered by the operator, calculated by the instrument from ambient atmospheric pressure, or measured in the dedicated p0 station cell throughout</li> </ol>		

		<p>the isotherm measurements.</p> <p>4. Must include no less than 25, peer-reviewed, density functional theory (DFT) models comprising both Non-Linear DFT (NLDFT) and Quenched Solid DFT (QSDFT), for accurate pore size calculations of carbons</p>		
1.23.	Warranty	A one-year standard warranty <b>shall be provided</b> after completion of installation and commissioning.		