



**INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION**

PR NO.1000048157

RFx No.6100002232

**Technical Specifications for Inductively coupled Plasma Mass
Spectrometer (ICP-MS)**

Sr.No.	Specification	Technical Compliance (YES/ NO)	Additional Information (if any)
Application			
1	All Elements of the Periodic Table from minerals, ore & Environmental samples like water, wastewater, sludge, sediments including Sea water analysis from 1000-10000 ppm to ppb at a time. Detection of Fe, Ni, Co, Cu, Mo, W, etc in alkaline solutions such as 6 M KOH with a few ppb to a few thousand ppm detection limit.		
Basic Design			
2	Instrument mainframe should be benchtop utilizing minimum lab bench space.		
3	Should have external rotary pump and a single 2-stage turbo molecular pump.		
4	Sample and skimmer cones should be easily mountable and dismountable without any tool like screwdriver, tweezer etc.		
5	Should include individual Mass Flow Controller for Plasma, auxiliary, Nebulizer, makeup and carrier gases.		

6	All ion lenses should be outside the high vacuum region for maintenance-free replacement by operator. Lens cleaning and replacement procedure should be without the need to put off or open the main vacuum system to minimize downtime.		
Sample Injection			
7	ICPMS should be quoted with Glass/Quartz concentric nebulizer, Spray chamber, quartz torch, and wide bore quartz injector capable of handling aqueous samples.		
8	Nebulizers: Glass/Quartz concentric.		
9	Spray Chamber: Peltier-cooled Glass/Quartz.		
10	Torch: One piece quartz torch of 2.5 mm ID.		
11	Torch control: The torch position should be fully computer- controlled & auto-tunable in XYZ axes with movement in each axis independent of other two. Torch position resolution & reproducibility should be 0.1 mm in all three axes.		
12	Injector: Wide bore quartz.		
13	Peristaltic Pump: High precision minimum 3-channel roller pump allowing precise computer control of sample pumping. Peristaltic pumps should be located adjacent to spray chamber for faster rinse in/out & minimum transfer line volume.		
Plasma Generations			
14	Digitally driven with solid state generator of 27 MHz RF with range 500-1600 watts (max) generator.		
Ion Focusing and Guiding System			
15	Ion Focusing and Guiding System: Should be capable of minimizing interface background (≤ 1 CPS in no gas mode).		

16	Ion Focusing and Guiding System: Should have mechanism to remove photons & neutrals from ion path.		
Collision/Reaction Cell			
17	Must be operated in collision mode, using pure Helium (99.999%) for all elements in periodic table.		
18	Should be able to be used for multi-element analysis of unknown sample containing Cl, SO ₄ , and Organic content, without the need for any interference correction equations. All interferences shall be removable by the Cell.		
19	Should be able to remove ClO interference on Vanadium, to enable good V measurement in chloride matrices. Shall		
	demonstrate applicability for trace determination of V in a chloride matrix, in cell mode.		
Mass Spectrometer			
20	Quadrupole Mass Analyzer.		
21	Quadrupole should be of Hyperbolic design.		
22	Quadrupole shall be driven by fully Digital RF generator with frequency 3 MHz.		
23	Mass range: 2-260 amu or above.		
24	Background Equivalent Count (BEC) would be less than 3 cps (In No gas mode).		
25	Background Equivalent Count (BEC) would be less than <0.5 cps (In gas mode).		
26	Abundance Sensitivity (at Cs): Low Mass side: $\leq 5 \times 10^{-7}$.		
27	Abundance Sensitivity (at Cs): High Mass side: $\leq 1 \times 10^{-7}$.		
Ion Detector Assembly			
28	Discrete dynode electron multiplier type detectors that can operate in simultaneous dual mode.		

29	10 orders of magnitude or more of linear dynamic range.		
30	Working concentration range of the detectors should be from the detection limit to 500 ppm or more with a maximum of 1000 ppm in Gas mode without any adjustment of parameter settings.		
Future Upgradation Options			
31	System should be upgradable with accessories to handle dirty high matrix, high TDS samples, dilution accessories, etc., avoiding manual liquid dilutions.		
32	System should be upgradable to handle samples having HF & organic media as required.		
33	System should be upgradable to high sample capacity autosampler, preferably manufactured by the same instrument vendor.		
34	Collision/reaction cell should be capable of upgrading with dedicated reaction gas lines if required in future.		
35	System should have capability to integrate with any commercially available laser ablation device for routine/research applications in future.		
36	Should have optional provision of Arsenic & Chromium speciation for specialized applications.		
Included Items			
37	Hydride Generator.		
38	Recirculating Chiller.		
39	High-quality Gas filters for the gases used.		
40	Interface for dirty, high matrix & high sensitivity as applicable.		
41	Two additional torches, tubing, pump oil.		

42	All necessary software and accessories.		
General Conditions			
43	Instrument and all its subunits should operate on 230 ± 10 volts 50 Hz power supply.		
44	All performance specification documents should be provided along with tender duly stamped and signed.		
45	In case of breakdown, servicing to be done immediately by supplier during warranty period; Maximum downtime– period is 1 week (six working days).		
46	Warranty: 1 year from the date of installation with full service free of cost whenever required.		
47	Delivery: 6-8 weeks from the receipt of PO.		
48	Training: On-site within 2-4 weeks of delivery. All expenses associated with the Training at IIT Bombay will be borne by the vendor.		
49	Supplier should install the instrument at IIT Bombay and demonstrate and train chemists/engineers for operation, method development, and routine maintenance.		
Other Performance Specifications			
50	Sensitivity of elemental mass should be ≥ 50 Mcps/ppm across the mass range.		
51	Collision reaction cell should perform in Helium gas mode for all elements having polyatomic interference and application notes should be provided.		
52	Short term stability and long-term stability of the instrument should be < 3%.		
53	Semi Quantitative mode should be able to operate in collision mode to generate qualitative scan of elements in less than a minute.		
54	Software should be capable of including QC check in between samples and must be able to show graphically QC control data.		

55	The vendor should quote for the latest model available and should guarantee for the availability of necessary spares and service support for next 10 years from the date of installation of the instrument at site.		
56	Technically eligible vendors may be required to conduct a product demo at the Mechanical Engineering Department of IIT Bombay. It will be the vendor's responsibility to provide all necessary accessories and supplies for a successful demo. Vendors will have a reasonable period of 21 calendar days to arrange the demo from the product-demo notification date. Failure to conduct the demo within this timeframe from the date of notification will result in a disqualification. Additionally, vendors who do not meet the technical requirement(s) during the demo will also be disqualified. Each vendor will be allowed a maximum of one demo session, with no possibility for rescheduling or repeat demonstrations. All expenses associated with the demo at IIT Bombay will be borne by the vendor.		