INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

MATERIALS MANAGEMENT DIVISION

Powai, Mumbai 400076.

Ref No.(PR No-1000054319) **(Rfx No. 6100003010)**

Technical Specifications : Metal 3D Printer (Qty : 1nos)

Sr. No	Item Description	Detailed Technical Specification	Technical Compliance (Yes / No)	Additional Information (if any)
1.	**Metal 3D Printer (Qty : 1nos)**			
1.0	**TECHNOLOGY REQUIREMENTS**	I)The additive manufacturing system shall be based on Laser Powder Bed Fusion (L-PBF) technology using a high precision continuous wave fiber laser as the melting heat source.		
		II)The laser shall be capable of completely melting metallic powder feedstock to produce dense components with minimum relative density ≥ 99.9% without the use of binders		
		III)The system shall be capable of processing both reactive and non-reactive metallic materials.		
		IV)The quoted system shall be a commercially available, proven production model and not a prototype or developmental system		

		V)The system shall be designed for research, alloy development, and industrial job production applications		
1.1	**Laser System Specifications**	I) Continuous wave fiber laser with minimum 500 W power and capacity to upgrade to dual laser/higher power laser		
		II)The system architecture shall permit future upgrade to higher laser power without complete replacement of the machine		
		III)Laser wavelength shall fall within standard fiber laser operating range (~500–1100 nm).		
		IV)Beam spot diameter at focus shall be between 30–100 µm		
		V)Laser scanning speed shall be ≥ 7 m/s.		
		VI)Closed-loop laser power monitoring and stabilization mechanism shall be provided		
		VII)The scanning system shall be galvo-based and equivalent high precision scanning architecture		
1.2	**Build Envelope & Processing Capability**	I)Minimum usable build volume shall be: 150 mm × 150 mm × 120 mm (X × Y × Z) or higher		
		II)Build geometry may be rectangular/cubical or cylindrical, provided usable volume satisfies Clause 1.3.1.(1 Minimum usable build volume shall be: 150 mm × 150 mm × 120 mm (X × Y × Z) or higher.		

		III)Minimum achievable layer thickness shall be 30 µm or smaller		
		IV)Adjustable layer thickness up to 80 µm or higher shall be supported		
		V)Minimum feature size shall be ≤ 150-300 µm		
		VI)Minimum build rate shall be ≥ 3 cm^3/hour.		
		VII)Build platform positioning repeatability shall be ≤ 50 µm.		
		VIII)Build plate preheating capability shall be minimum 200°C or higher		
		IX)A total of five (5) build plates shall be supplied along with the system		
1.3	**BUILD CHAMBER & ATMOSPHERE CONTROL**	I)The system shall operate under both Nitrogen and Argon atmosphere		
		II)The build chamber shall be fully gas-tight and suitable for reactive material processing		
		III)Continuous oxygen monitoring system shall be provided		
		IV) Oxygen concentrations shall be maintainable at ≤ 0.2%.		
		V)Automatic process interruption shall occur if oxygen exceeds permissible limit.		
		VI)Integrated dual-stage HEPA H14 (or equivalent) filtration system shall be provided for process gas recirculation.		

		VII)Gas consumption shall not exceed 5 L/min under standard operating conditions		
1.4	**RECOATING & POWDER HANDLING**	I)The system shall include both soft and hard recoating mechanisms		
		II)Minimum ten (10) soft recoaters and ten (10) hard recoaters shall be supplied		
		III) Recoaters shall be rated for minimum 5000 hours of operation		
		IV)Powder handling system shall be suitable for both reactive and non-reactive powders		
		V) Powder sieve station shall be supplied: Suitable for reactive and non-reactive powders, Mesh size 63–90 µm, Stainless steel contact parts		
		VI)Industrial dry/wet vacuum cleaner shall be supplied: Explosion-proof (ATEX Zone 22 or equivalent) HEPA filtration, Suitable for metallic powder handling		
1.5	**FEEDSTOCK & MATERIAL REQUIREMENTS**	I)Powder Flexibility		
		II)The system shall allow use of: Commercial powders, Third-party powders, Custom-designed alloy powders, In-house developed compositions		
		III)Use of third-party or custom powders shall not void warranty		

		IV)Supplier shall assist in parameter development for new alloys during warranty period without additional cost.		
1.6	**Multi-Class Material Capability**	I)The system shall be capable of processing: Stainless steels ,Tool steels, Maraging steels Nickel-based superalloys, Titanium alloys, Aluminium alloys, Copper alloys, Cobalt-chromium alloys, Experimental alloy systems		
1.7	**Complimentary Powders**	I)Minimum 10 kg each of: Ti-6Al-4V, AlSi10Mg SS316L Certificates of analysis shall be provided.		
1.8	**SOFTWARE & RESEARCH FLEXIBILITY**	I)Process Parameter Control All primary process parameters shall be fully open and editable, including: Laser power, Scan speed, Hatch spacing, Layer thickness, Scan strategy, Scan rotation, Exposure parameters, Recoat parameters, Spatial variation of parameters within a layer shall be supported		
1.9	**Pre-Processing & Build Preparation**	I) Standard tessellation language(STL), Standard for the Exchange of Product model data (STEP), Initial Graphics Exchange Specification (IGES) and Additive Manufacturing Format (AMF)compatibility		
		II)Automatic and manual support generation		
		III)Automatic nesting of multiple parts		

		IV)Automatic part orientation optimization		
		V)Adaptive slicing capability		
		VI)Build time estimation		
		VII)Powder consumption estimation		
		VIII)Detailed build report including geometry, parameters, build time and material usage		
		IX)Lattice structure generation capability		
		X)Minimum one perpetual full license		
1.10	**Open Architecture & Custom Path Planning**	I)The system shall provide open architecture enabling customized scan strategy implementation.		
		II)Users shall be able to implement and execute customized path planning codes developed at the institute		
		III)Access to API/SDK or open vector file format shall be provided		
		IV)Documentation and training for custom path planning shall be provided.		
1.11	**ACCESSORIES (MANDATORY SUPPLY)**	I)Industrial filter unit		
		II)Industrial voltage stabilizer sized for full system load		
		III)Closed-loop industrial water chiller (±0.5°C stability		

		IV)CNC Wire Electrical Discharge Machine (Wire EDM)		
		V)A CNC Wire Electrical Discharge Machine (Wire EDM) shall be supplied for precision cutting and separation of additively manufactured components from build plates.		
		VI)The Wire EDM shall be suitable for machining: Stainless steels, Tool steels, Nickel-based superalloys, Titanium alloys, Aluminium alloys, Copper alloys		
		VII)The machine shall have minimum table size suitable for handling build plates of 250 mm × 250 mm or larger.		
		VIII)Maximum workpiece height shall be 150 mm or higher		
		IX)Positioning accuracy shall be ≤ ±5 µm		
		X)Surface finish capability shall be ≤ 1.5 µm Ra or better		
		XI)CNC controller shall support multi-pass precision cutting		
		XII)Automatic wire threading system shall be provided		
		XIII)Dielectric circulation and filtration system shall be included		
		XIV)Necessary tooling, fixtures and installation accessories shall be supplied		
		XV)Minimum two (2) year comprehensive warranty shall be provided for the Wire EDM machine		
		XVI)Operator training for minimum five (5) personnel shall be provided		

		XVII)Argon Gas Supply System: Minimum three (3) each of Argon and Nitrogen cylinders (≥99.99% purity) Regulator and manifold setup		
		XVIII)Industrial UPS: Minimum 30 minutes backup under full load Safe shutdown capability		
		XIX)Support Removal & Finishing Tools: Mechanical support removal tools, Post-processing hand tools, Surface finishing tools suitable for metallic Additive manufacturing components		
1.12	**SAFETY REQUIREMENTS**	I)Personnel safety accessories: Laser safety goggles, Respirator masks, Anti-static gloves, Protective clothing should be provided		
		II)Special design provisions shall be incorporated to prevent accidents		
		III)Emergency Stop button(s) shall be provided at accessible locations		
		IV)Safety manuals and warning charts shall be provided		
		V)Safety training shall be provided at installation		
		VI)Complete Occupational Health & Safety documentation shall be supplied		

1.13	**DOCUMENTATION REQUIREMENTS**	I)Operation manual I)Software manual II)Maintenance manual III)Safety manual IV)Flow diagrams V)Electrical line diagrams VI)Process parameter database VII)Spare parts list for minimum 3 years		
1.14	**WARRANTY & CONTINUOUS OPERATIONAL SUPPORT**	I)Minimum two (2) years comprehensive warranty from date of installation for the whole system/equipment. II)Continuous operational support during warranty period without additional cost. III)Minimum two (2) visits per year by service and application engineers. IV)Total cost quoted shall be inclusive of these visits. V)Warranty shall remain valid for third-party powder usage.		

1.15	**PRE-QUALIFICATION & COMPLIANCE REQUIREMENTS**	I)Bidder shall be OEM or authorized legal representative in India. II)OEM and/or bidder shall possess valid ISO certification (ISO 9001: 2015, CERTIFICATE NO- BN19401/18357 and ISO13485. III)Global reference list and Indian user list shall be enclosed at least 2. IV)Operational status of supplied systems in India shall be provided atleast 2. V)Total weight of the system shall be specified. VI)Clause-wise compliance statement with documentary evidence shall be submitted		
1.16	**INSTALLATION, COMMISSIONING & TRAINING**	I)Complete installation and commissioning at site. II)Commissioning trials shall be conducted. III)Two-week training for minimum 5 personnel. IV)Safety training mandatory.		
1.17	**INDUSTRY ENGAGEMENT & SUSTAINABILITY SUPPORT**	I)Supplier shall assist for one (1) year in identifying and facilitating industrial Additive Manufacturing job opportunities. II)Support shall include technical demonstrations and initial job execution assistance.		