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| **SI.**  **No.** | **Description** | **Specifications** |
| 1 | Description | Capability to build / print sufficiently strong parts with high surface quality that can be used for product development and prototyping using polymer-based composites (Continuous & Chopped Carbon Fibres) and metal alloys. |
| 2 | Printing technology | Continuous Fiber Filament Fabrication (CFF) + Metal Fused Filament Fabrication Technology with Swappable  Print Engine for Polymer/Metal & Fibre |
| 3 | Build Size | 360 mm x 300 mm x 300 mm or larger |
| 4 | Materials | Nylon Based Matrix Material operable at 140 ○C  Carbon fiber   * With embedded chopped Fibre * Continuous Carbon Fiber * Carbon FR Material   Stainless Steel, Nickel based alloys, Copper alloys |
| 5 | In process inspection | Imaging system with process monitoring |
| 6 | Z layer resolution | Better than 100 microns |
| 7 | Build Chamber | Heating - 50 °C or more with temperature accuracy of at least 2 °C  Auto lock during operation  Applicable Safety regulations |
| 9 | Bed | Vacuum-sealed heatable metallic print bed  Scale/markings/grooves as reference for scanning by laser-based micrometer system  Automatic (self) leveling |
| 10 | Build Plate | Removable  Vacuum gripped to the build platform |
| 11 | Extrusion System | 1. Separate extrusion systems for composite and metal printing. 2. Composite extruder should have multiple and independent nozzles 3. Metal extruders should have 2 Nozzles one for Metal Material and one for release material. 4. Nozzle should be able to sustain a minimum of 300 °C 5. Modular system for easy maintenance and replacement |
| 12 | Material Chamber | A minimum of 4 separate spool bays, each equipped with an individual pre-extruder that connects to a material routing block through flexible tubing, driving and directing material from the spool to the nozzle. |
| 13 | Calibration | Auto Calibration of all axes, nozzle(s), print head |

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| 14 | Printer should print | Continuous fiber-reinforced polymer-matrix composite parts, Microfiber filled composite parts, Food grade Plastic Parts, Electrostatic Discharge application parts, Fire Retardant Composite parts, Metal Parts  Tooling, Functional Prototyping, End-user parts, Direct  Food contact Parts and Structural Parts should be printable |
| 15 | Software | Slicing software for 3D printing management, allowing remote monitoring and control of printing processes with the following features:   1. ISO certifications for security. 2. Online Cloud storage of 3D CAD files. 3. Should be able to send the programs remotely. 4. Integrated laser scanners on the machine for quality control, continuously checking accuracy layer by layer, providing a comprehensive analysis of the final part with the help of in-process inspection. 5. Simulate and validate parts made of metals, continuous fiber, and plastics to assess performance, providing optimized print settings with different options for layer height, infill density and material aimed at reducing print time and material consumption while checking deformation under load conditions 6. The software supplied must be from the same OEM and compatible with prevailing OS like Windows 10 or higher versions. 7. Capability to import STL format files from CAD packages such as SolidWorks, Catia, Creo, Siemens, Inventor etc. 8. Capability to generate different internal customizable build styles (honeycomb to solid) along various regions/segment of the part along the same cross section. 9. Software should also allow the user to edit the internal structure of each layer and/or group of   layers of the CAD model. |
| 16 | Machine Monitoring | Transparent front side for visualize the printing process.  Remote monitoring of printing progress and consumables with data logging. |

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| 17 | De-binding Station | Compatible-sized de-binding station must be provided  that operates with inbuilt process control |
| 18 | Sintering Station | Compatible tubular sintering furnace with atmosphere control for Sintering of printed metallic parts. Furnace should operate up to 1350 °C with accuracy of at least 2 °C and should have a possibility to impose Argon and Hydrogen atmosphere during sintering.  Furnace uniform heating zone dimensions: Minimum 12 cm diameter and length 30 cm |
| 19 | Automatic Material Changeover | Material should change automatically from 2nd bay once the material in 1st bay is finished |
| 20 | Layer height: | Minimum 125 μm Maximum 250μm |
| 21 | Filament types: | Printer should support filaments supplied by different OEM’s.  A minimum of 10 spools per year of all materials to be supplied with the printer. |
| 22 | Touch screen panel: | 7 inch minimum |
| 23 | Regulatory Compliances | Material handling, storage, and disposal performed according to local laws and regulations should be provided |
| 24 | Print quality control | It should be possible to Define a tolerance specification in control software, and the Printer should scan the part while it's printing to ensure that it always meets the design.  Error alert  Remote print and control |
| 25 | In process inspection | The quoted printer should be capable of quality and precision in 3D printing. It should Scan the parts mid-print using the laser displacement sensor affixed to the print  head & must ensure dimensional accuracy at the most critical tolerances at any point in the 3D print. |
| 26 | Accessories | All essential accessories like Wash, Sinter, gas cylinders with regulators, etc., are to be supplied with the machine for smooth operation. |

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| 27 | Warranty | 3 Years Comprehensive, including Spares for Wear & Tear of the parts as per preventive maintenance schedule. |
| 28 | Safety | Printer should have all necessary safety features to protect the user & printer from any risks |