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MATERIALS MANAGEMENT DIVISION
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Technical Specifications for Multi-material 3D printer

1. A multi-functional additive manufacturing tool for use in R&D, Product Development and Low Volume Manufacturing.

2. Allows the user to deposit ink/paste synthesized from range of materials such as polymers, metallic nanoparticles, polymer nanocomposites, dielectrics, semiconductors, ceramic nanoparticles, elastomers, biomaterials, adhesives etc onto a wide variety of 2D and 3D substrates without conventional masks or thin-film equipment.

3. The system should be capable of printing wide range of commercially-available materials including metal nanoparticle inks, diluted thick film pastes, thermosetting polymers, UV curable photopolymers and solvent-based polymers like polyimide and polyurethane. Also,
    - Conductor inks including silver, gold, platinum and copper.
    - Ceramics, ruthenates and ferrite based inks.
    - Semiconductor, resistor, dielectric adhesives, and etch resist formulations should be printed on a wide variety of substrates including polyester, polyimide, glass, C-Si, ceramic, FR4 and metal materials.
    - Biomaterials such as proteins and DNA and Bio-degradable polymers such as PLGA.

4. The platform should be equipped with the non-contact functional print technologies based mainly on Aerosol-jetting and can have supplementary technologies such as Piezo jet, Inkjet and dispensing etc. The system should use high purity nitrogen as a carrier gas as well as sheath gas.

5. System to be capable of printing on any arbitrary 2D or 3D curved surface with 5-axis automated coordinated motion control system.

6. Motion Module (5-axis) Specification :
- Motion Range (i.e. minimum print area): 200 x 200 x 150mm (X-Y-Z).
- Position Accuracy: ±10 microns
- Position Repeatability: ±2 microns (within a 100mm working envelop)
- Rotational and Pivot Axis:
  Rotational position accuracy: 80 arc sec, Rotational repeatability: 03 arc sec
  Pivot axis position accuracy: 80 arc sec, Pivot axis repeatability: 03 arc sec

7. The minimum feature size to be of the order of 20 microns. Additionally, system capable of printing wide feature sizes of the order of mm range.

8. The deposition inks should have a range of viscosity values varying from 1- 500 cps.

9. Print-head
    - Compact, modular print head design and simple operation
    - Design for easy cleaning with removable/replaceable ink cartridges or reservoirs
    - The system should have Interchangeable Print Heads with various nozzle geometries allow for feature size flexibility ranging from 20 microns to millimeters.
    - The System includes interchangeable fine feature print heads capable of printing features sizes from 20 to 250 microns.
    - The system should be capable of non-contact printing with nozzle stand-off height up to 5mm from nozzle tip to surface.
    - Heated heads
    - Advanced vision system with Integrated sensor, camera and software to visualize the print head motion, observe the drops and capture the images.

10. Unified solution – Single source for complete Hard- and Software package.
11. Post- processing (for curing and annealing such as UV, IR or Light beam or Laser sintering etc.) technologies to be provided with the system.

12. System placed inside a metal cabinet with suitable working platform and open ports for accessing.

13. Accessories such as vacuum pumps, chillers, spare kits and necessary consumables to be provided along with the system.

14. Compliance statement: Compliance statement of the above mentioned technical specifications should be provided by the vendor along with the quotation.

15. Heated vacuum platen to be provided.

TERMS AND CONDITIONS

1. The system must be complete in all respects and the manufacturer must ensure complete integration of all sub system with cables, connectors as required and take the responsibility for service.

2. Total footprint, weight and cooling requirements, if any, to be clearly mentioned and will be an important factor.

3. Vendor has to provide complete set of operation, service & maintenance manual, technical manuals with full diagrams and drawing in duplicate.

4. Vendor should supply the original invoices, original warranty certificates and original test reports of the imported items.

5. Installing and commissioning: The supplier or his representative will do installation and commissioning of the equipment at IIT Bombay. The infrastructure/utilities required from IIT Bombay during installation and commissioning should be intimated with the offer.

6. Training: Training should be given for at least 2 days by the firm engineer at user's site after completing the installation and commissioning of the system by the vendor without any additional charges.

7. Acceptance: Upon post-dispatch of equipment, it will be accepted as per the following acceptance criteria: Demonstration of all controls, safety devices, etc.; Testing of complete assembled unit and printing of inks/pastes of silver, adhesives or biomaterials with varied viscosity ranges. Also the printing of fine line features of 20 microns should be demonstrated with suitable materials.

8. Warranty: The complete system must be guaranteed for free repair/replacement for a minimum period of three years from the date of complete installation.

8. Requesting following additional information from vendors:

- Brochure of the standard equipment.
- Details of current installations.