西湖未来智造
enovate3D

EP600-FP-5X

UNIVERSAL 5-AXIS ELECTRONIC ADDITIVE MANUFACTURING PLATFORM

Curved Surface Conformal Printing

5-Axis Precision Coordination

Digital Flexible Manufacturing

OVERVIEW

enovate3D's EP600-FP-5X Universal 5-Axis Electronic Additive Manufacturing Platform integrates a high-precision 5-axis motion system with direct-write printing technology, enabling the precise deposition of various functional materials — including conductive, insulating, and encapsulation materials — onto complex curved substrates. By importing CAD models or using parametric programming, users can drive the device to automatically perform 3D trajectory planning and printing, enabling one-stop manufacturing from 2D to 3D circuits. This process replaces traditional multi-step processes such as photolithography, masking, and lamination, significantly shortening R&D and customization cycles while reducing overall costs, and providing an efficient and flexible manufacturing solution for innovative electronic designs.

KEY FEATURES

- Minimum line width of 60 µm on curved surfaces
- Supports precise dispensing of diverse inks/materials
- Simplified tool path generation via direct CAD import
- Available in simultaneous or 3+2 positional versions
- Working area of 180 × 180 × 90mm
- Designed for R&D and prototyping applications

APPLICATIONS

APPLICATION SCENARIOS

Designed for the direct fabrication of conformal circuits and functional devices on 3D curved surfaces, flexible substrates, and complex structures, such as 3D smartphone antennas, molded interconnect devices (MIDs), and embedded sensors. By replacing traditional methods like photolithography, etching, SMT assembly, or curved-surface electroplating, this process significantly reduces operational complexity and material waste while supporting cost-effective production for small-batch, highly customized requirements.

PROCESS SOLUTION

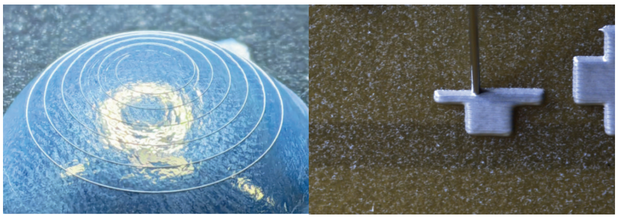
Utilizing DIW printing technology integrated with a high-precision five-axis motion system to achieve precise patterned deposition of various functional electronic pastes on 3D surfaces. Compatible with conductive inks, dielectric materials, and encapsulation adhesives, the material is applied via fluid extrusion and finalized through post-treatment processes such as curing or baking. Offering high design freedom, rapid prototyping iterations, and excellent surface adaptability, this solution is particularly well-suited for R&D and small-scale flexible manufacturing scenarios.

SPECIFICATIONS

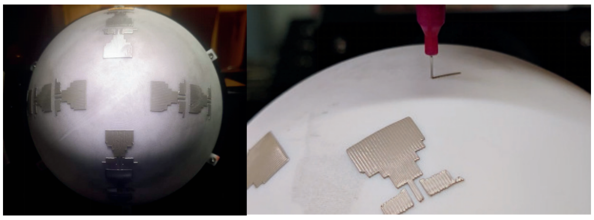
Motion System	
Equipment Frame	Granite Motion Stage
Working Area	Supports a hemispherical processing volume of 180 × 180 × 90 mm
Accuracy	X/Y: ±3 μm ; Z1/Z2: ±5 μm
Repeatability	X/Y: ±1 μm ; Z1/Z2: ±2 μm
Max Motion Velocity	X/Y: 500 mm/s ; Z1/Z2: 100 mm/s
Printing System	
Default Processing Module	2 sets of DIW modules, supports multi-material printing
Optional Processing Modules	DIW modules can be replaced with the following processing modules
Mechanical Milling	For drilling interconnect holes or surface milling of printed structures,etc.,with drilling aperture ≥50 μm
Piezoelectric Jetting	For jetting dispensing of adhesive materials,minimum dot size: 250 μm
Diaphragm Valve	For improving 3D forming quality and enhancing printing consistency for vertical structures such as columns and walls
Printing Nozzles	Glass,ceramic,stainless steel nozzles
Printing Accuracy	Resolution: 60 μm to mm-level;Compatible with material viscosities from 10–10^6 mPa·s
Printing Materials	Conductive pastes, epoxy resins, silicone resins, UV resins, etc.
Printing Pressure Range	0-100 psi±0.25% FS
Loading System	
Stage Material	Aluminum vacuum chuck or mechanical fixtures
Stage AC Axes	Standard A/C rotary axes with a 5-axis trunnion (cradle) architecture;Available in 5-axis simultaneous or 3+2 positioning versions
Auxiliary System	
Vision System	Standard tilted and vertical observation system Enables real-time monitoring of printing status, with automatic fiducial recognition capability Equipped with a laser triangulation sensor Optional 3D laser profiler: Available only for the 5-axis simultaneous version; supports 3D surface profiling and calibration
Pre-printing Unit and Nozzle Cleaning Unit	Equipped with a contact sensor for Z-height calibration of rigid printing nozzles (e.g., ceramic, stainless steel), it enables process parameter fine-tuning within pre-print zones and includes a rotary brush unit for automated removal of residual material and contaminants from the nozzle tip
Curing and Sintering Unit	Optional: UV curing lamp, infrared sintering laser
Installation	
Equipment Dimensions	W1500 × D1200 × H2190 mm
User Interface and Control System	Includes 1 license for 5-Axis Simultaneous Control Software (Exclusive to 5-axis simultaneous version) Includes 1 license for Digital Twin Software;generates processing paths directly from 3D model imports (Exclusive to 5-axis simultaneous version) Includes 1 license for EnovateCAM Process Control Software
Equipment Weight	1500 kg (approx.)
Electrical Requirements	220 VAC/ 50 Hz, 6 kW
Air Supply Pressure	≥0.6 MPa (CDA)
Operating Environment	Temperature: Preferably 22±2 ℃;Humidity: Preferably ≤65%

APPLICATIONS

SAMPLE IMAGES



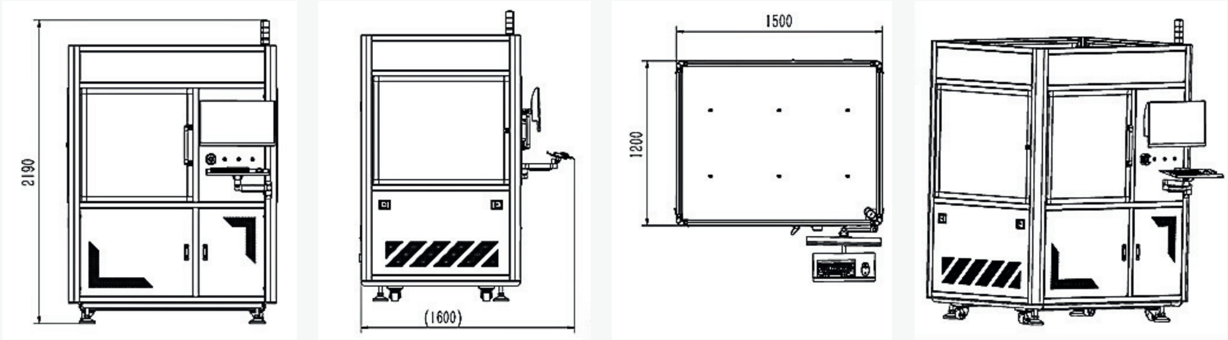
Conformal Antenna Printing



Spherical Circuit Printing

Freeform Surface Pattern Printing

DIMENSIONS



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