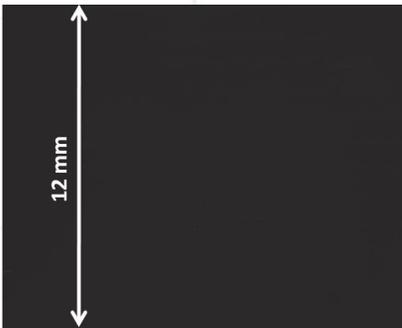




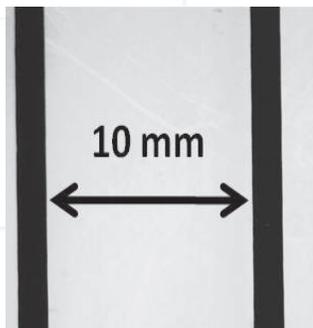
3MM Wide Nozzle Print Head

The Aerosol Jet 3MM Wide Nozzle Print Head is ideally suited for producing millimeter-scale electronic features, for applications such as Coatings, Busbars, Antennae, and Component Encapsulation.

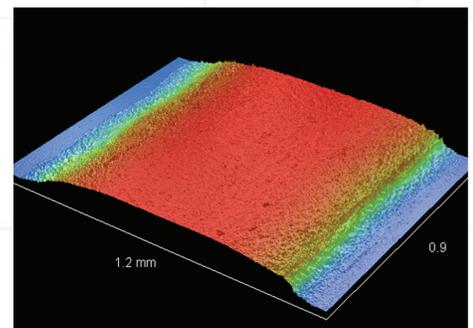
The Aerosol Jet Wide Nozzle Print Heads are an extension of Optomec's revolutionary fine-feature printing technology that is used to produce geometries as small as 10 microns. The 3MM Wide Nozzle Print Head is the first release in this family of new hardware that enables non-contact, room temperature printing of large features in a single pass. Using a series of standard interchangeable size nozzles, the 3MM Wide Nozzle Print Head can produce geometries from ca. 0.3mm to 1.5mm wide, with layer thickness ranging from ca. 100nm to 10's of microns. As with all Aerosol Jet solutions, a broad range of material types are supported, including conductive pastes and nanoparticle inks, dielectrics, polymers, masking materials and even biomaterials; all of which can be precisely deposited onto planar and 3-dimensional surfaces.



Example: Area fill deposition using adjacent pass printing with 3MM Wide Nozzle Print Head (3mm nozzle size).



Example: 1.4 mm wide obscuration strips, deposited with 3MM Wide Nozzle Print Head, spaced 10 mm apart.



Example: Profilometry shows 3MM Wide Nozzle produces uniform layer thickness with good edge definition.

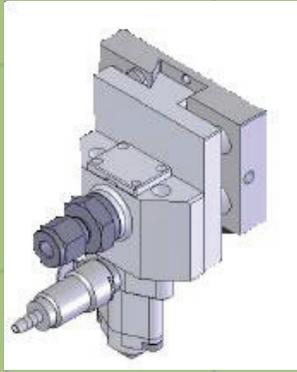
FEATURES

- » Prints up to 1.5mm wide in a single pass
- » Prints wide strips with good edge definition
- » Thin layer deposits from 100 nm
- » Thickness and width variation control
- » High material utilization rates
- » Support for wide array of materials
- » Low temperature processing
- » High manufacturing uptime

APPLICATIONS

- » Large conductive features (busbars, backplanes)
- » Large area thin film coatings
- » Selective coatings (insulators, cross over circuits)
- » Fuel Cells
- » Conformal antennae
- » Component Encapsulation
- » Molded Interconnect Devices

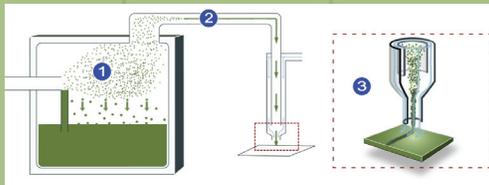
Aerosol Jet Process



3 MM Wide Nozzle Print Head

How the Aerosol Jet process works:

- (1) A liquid sample is atomized, creating a dense aerosol composed of droplets with diameters between approximately 1 and 5 microns.
- (2) The aerosol is transported to the deposition head using an inert carrier gas.
- (3) The aerosol is focused within the deposition head by an annular sheath gas. The resulting high-velocity jet is deposited onto the substrate, creating features ranging from 300 microns to >1.5mm with thicknesses from 100 nanometers to 10+ microns.



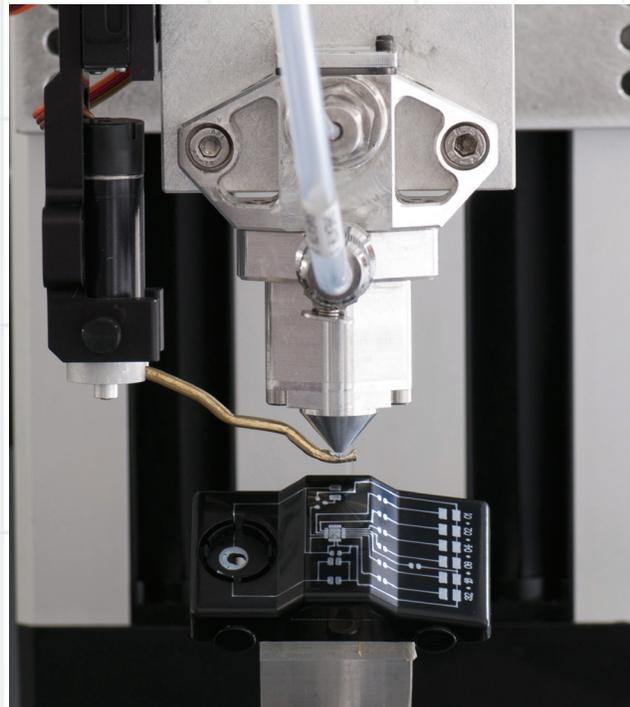
The Sprint Series 3MM Wide Nozzle head with independent atomizer and head technology provides maximum flexibility in material selection ideal for rapid prototype development. The Marathon series 3MM Wide Nozzle Head with integrated atomizer and head technology provides maximum process control ideal for production applications. A motion-control system allows for the creation of complex patterns on the substrate.



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3MM Wide Nozzle Application Example: MID



3-D Molded Interconnect Device, with Silver on PC/ABS (Wide nozzle shutter shown in photo is a customer special implementation. Call factory for availability).

Aerosol Jet 3MM Wide Nozzle Print Head Specifications

Nozzle Sizes	Round: 0.5, 0.75, 1.0 mm Slotted: 2.0mm x .50mm, 2.5mm x .50mm, and 3.0mm x .50mm
Deposition Widths	0.3mm to 1.5mm in a single pass (material dependent)
Layer Thicknesses	100 nanometers to 10+ microns (print speed and material dependent)
Ink Viscosity Range Pneumatic Atomizer	1 to 1000 cP (Heating may be used to reduce ink viscosity to achieve atomization of more viscous inks)
Pneumatic Atomizer heater/stirrer	Controls ink temperature, 25-60°C, Stirrer revolutions per minute, user selectable (Sprint Series Only)
Droplet size	1-5 μm \emptyset
Stand-Off Height	Up to 5mm
Utilities - Gas	CFM Nitrogen Gas Input @ 80 PSI for atomizer operation

ABOUT THE COMPANY

Optomec® is the world leading provider of additive manufacturing systems for high-performance applications in the Electronics, Biomedical, Photovoltaic, and Aerospace & Defense markets. The company's experienced product engineering and process development team is dedicated to creating solutions for breakthrough production capabilities.

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