



Print, Materials and Curing

Print Methods

Screen

- Tool: HMI MSP-9156PC Automatic Screen Printer
- Description:
 - Fast sheet to sheet printing of large area single or panelized devices with thick trace heights.
- Print Capabilities:
 - Production:
 - 7.5 x 9" maximum print area
 - Minimum 150 μm lines with 150 μm pitch
 - 100 sheets a print session (without alignment)
 - 25-50 sheets a print session (with alignment, volume dependent on print requirements)
 - Research (with consultation):
 - 10.5 x 10.5" maximum print area on a 12" x 12" substrate
 - Minimum 75 μm lines with pitch variable on feature size/shape and ink selection
 - Capable of multilayer and double-sided prints with laser-drilled vias.

Inkjet

- Tool: Meyer Burger IP410 Inkjet printer (x2)
- Description: Printhead configurations
 - Konica Minolta KM512 Series (water- or solvent-based inks)
 - FujiFilm Dimatix SAMBA head (water-based inks)
- Print Capabilities: This tool is still in process development.

Aerosol Jet

The aerosol jet printer is capable of printing wide variety of materials and is a non-contact method of printing. Non-contact printing and 5-axis motion capability mean this tool can print on surfaces with varying heights and shapes.

- Minimum Width: 10 μm width, 20 μm pitch
- Print height: from 200 μm to 4 μm , material dependent
- Ink viscosity: 1-1000cP
- Work area: 200 x 300 x 200mm (x,y,z)
- 10 μm motion repeatability
- Full technical specs are here:
 - <https://www.optomec.com/wp-content/uploads/2014/08/AJ5X-System-WEB-0216.pdf>

Gravure Offset

- Tool: Komori PEPIO Print System
- Description: Printer capable of gravure offset and reverse gravure offset printing for fine featured conductive traces.
- Print Capabilities:



- 40 μm line width with 70 μm pitch done at NextFlex while Komori has demonstrated minimum line width down to 5 μm with pitch > 10 μm .

Extrusion

These extrusion techniques are compatible with thermoplastic extrusion of materials from polylactic-acid (PLA) to polyetheretherketone (PEEK), and liquid systems ranging from water like to clay like rheology. Jetting and spray extrusion methods require low viscosities while pressure-based extrusion methods are better suited to medium to high viscosity materials.

nScript Capabilities / Requirements:

- Length/Width: < 500 mm
- Thickness/total part height: < 150 mm
- Substrate Slope: < 45%
- Position accuracy: < 10 μm
- 5 heads including:
 - 2 Hot Melt Extruders
 - 2 Smart Pumps
 - 1 PnP head
 - 1 Mill Head
 - 1 Spray adapter
- Manual Optical Fiducial Alignment
- 653nm Laser Height Mapping
- Line width from 50 μm to 2 mm dependent upon material

Materials

- Ag inks
 - We use both flexible and stretchable inks from a variety of ink suppliers that can be printed by several methods and cured in an open-air environment.
- Cu inks
 - We have tested a variety of copper inks, including screen printing and aerosol jet inks. These include both reactive, open-air cure inks, and nitrogen curing.
- Substrates up to 200 x 300 mm (8 x 12")
 - PET
 - Low cost polyethylene terephthalate substrates with 5 mil (125 μm) thickness for curing at temperatures up to 150°C.
 - DuPont Teijin Films Melinex® ST505: colorless, transparent, glossy heat stabilized polyester film with a double-sided surface treatment for ink adhesion.
 - Coveme Kemafoil® HSPL 80: colorless, translucent, hazy heat stabilized polyester film with a double-sided surface treatment with a higher Rz to prevent ink slump.
 - PI
 - High performance polyimide substrates for thermal stability in 3 or 5 mil (75 or 125 μm) thickness for curing at temperatures up to 350°C.
 - DuPont Kapton® 300/500 HN: amber, transparent, glossy heat stabilized polyimide film.
 - TPU
 - Stretchable TPU substrates suitable for medical and wearables applications.



- DuPont Intexar® TE-11C: colorless, translucent, glossy bilayer thermoplastic polyurethane film with a high recovery elastic layer and a melt adhesive layer for bonding to fabrics.

Curing / Heat Treatment

- BTU reflow conveyer-belt oven with nitrogen curing capabilities
- Heraeus UV cure conveyer-belt oven
- Adphos IR cure oven
- A variety of box ovens
- NovaCentrix Pulse Forge photonic curing (2020)

For more information, contact NextFlex at info@nextflex.us.