

## THICK FILM SERVICES

Low Temperature Co-fire Ceramic (LTCC) technology incorporates multiple distinct sheets of metal- patterned, polymer-ceramic material that are then fused into a single homogenous assembly. The technology lends itself well to RF and high-frequency applications.

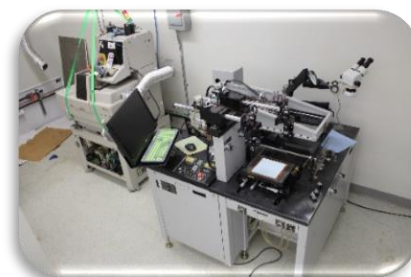
**USHIO MP4150 SL AUTOMATIC PUNCHER:** (Two automated punch tools with a quad punch and die configuration capable of punching at eight per second. The punch size ranges from 150 microns to 2.4mm. The tool is configured with a desktop PC to pull in NC data used to identify the coordinates for the punching.

1. Work size: Up to 150mm<sup>2</sup>
2. Punch units: 4 each
3. Charge: \$40/hour (academic)



**HMI MSP-885 SCREEN PRINTER:** The tool is configured with a print head capable of print/flood, flood/print and print/print. The system has a stage control capable of x,y and theta adjustment with micrometer control precision and vacuum lock. System utilizes a desktop PC with image capture software to help with screen to GreenTape alignment.

1. Screen capacity: 300mm<sup>2</sup>
2. Work size: 150mm<sup>2</sup>
3. Print resolution: 150µm
4. Charge: \$35/hour (academic)



**THERMO SCIENTIFIC 55.3L BOX FURNACE:** The furnaces are programmed to ramp to at least two different temperatures, the first at 400°C to burn out the polymeric components that made the GreenTape flexible or malleable during processing while the second at 850°C to sinter the individual sheets together into one homogenized assembly.

1. Work area: (3 shelves) 150mm<sup>2</sup>
2. Operating temperature: 400°C to 1,125°C
3. Utilities: Air
4. Sinter runtime: (DuPont 951 / DuPont 9k7) 10 / 27 hours
5. Charge: \$10/hour (academic)



**AVURE TECHNOLOGIES IL142005 SS ISOSTATIC LAMINATOR:** A batch-mode, semi-automatic isostatic lamination tool is currently configured to handle a batch of GreenTape assemblies hand packaged in water-tight and vacuum-sealed bags.

1. Work area: Up to 10, 150mm<sup>2</sup> plates
2. Operating temperature: Up to 75°C
3. Typical pressure: 3,000 psi
4. Typical lamination time: 18 minutes
5. Charge: \$60/hour (academic)



## THICK FILM SERVICES

The items listed here include tooling suited for 200mm pilot-production LTCC process.

**USHIO MP5200Z $\Theta$ /8200Z PUNCHER** : The tool is configured with a desktop PC to pull in NC data used to identify the coordinates for the punching. The software monitors punch status on a real-time basis as well as punch breaks. The theta  $\Theta$  option in the 5200Z indicates the work holder is equipped to adjust in theta to align to a work piece that has been previously punched.

1. Work size: Up to 200mm<sup>2</sup>
2. Punch units (5200Z/8200Z) 5 and 8 respectively
3. Charge: \$40/hour (academic)



**BACCINI AUTOMATED PUNCHER**: A true pilot-production automated punch tool currently configured with six electric and four pneumatic punch/die positions. The size of the punches ranges from 150 microns to 2.4mm. The tool is configured with a desktop PC to pull in NC data used to identify the coordinates for the punching. The tool has load and unload stations for automatic processing in pilot production mode.

1. Work size: 200mm<sup>2</sup>
2. Number of punch units: 8 electric, 4 pneumatic
3. Vision alignment option
4. Charge: \$60/hour (academic)



**MICROTEC 550TVC SCREEN PRINTER**: The tool is configured with a print head capable of print/flood, flood/print and print/print. The system has a stage control capable of x,y and theta adjustment with micrometer control precision and vacuum lock. System utilizes a desktop PC with image capture software to help with screen to GreenTape alignment.

1. Screen capacity: Up to 550mm<sup>2</sup>
  - a. Adapter: for 300mm<sup>2</sup> screens
2. Work area: Up to 200mm<sup>2</sup>
3. Charge: \$60/hour (academic)



**BACCINI AUTOMATED COLLATOR**: A true pilot-production automated collating tool currently configured with automated vision alignment and tacking accessories. The tool is configured with a desktop PC to pull in screen data used to identify the alignment of one GreenTape sheet to another. The tool has load and unload stations for automatic processing in pilot production mode.

1. Work envelope: 259mm x 109mm x 180mm
2. Positioning accuracy: 10 microns
3. Charge: \$60/hour (academic)

