



2155 Intelliplex Drive  
Shelbyville, IN 46176  
PH: (317) 642-0001  
[www.makuta.com](http://www.makuta.com)

## PRESS RELEASE

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# Makuta, Inc. Partners with Carbon, Inc. to Offer High-Performance Prototyping and Production of Small Plastic Parts

**[Shelbyville, IN — November 18, 2019]** Makuta, Inc. announced today that it is now a Certified Production Partner of Carbon, Inc., enabling the company to offer high-performance plastic parts prototyping and limited production runs using Carbon Digital Light Synthesis™ technology.

“We were truly excited when we saw this additive manufacturing technology in action, and are now pleased to expand our business capabilities by being able to offer this service to our customers,” said Stu Kaplan, President of Makuta.



*Using Carbon Digital Light Synthesis technology, small and complex parts “grow” out of a reservoir of UV-curable liquid resin.*

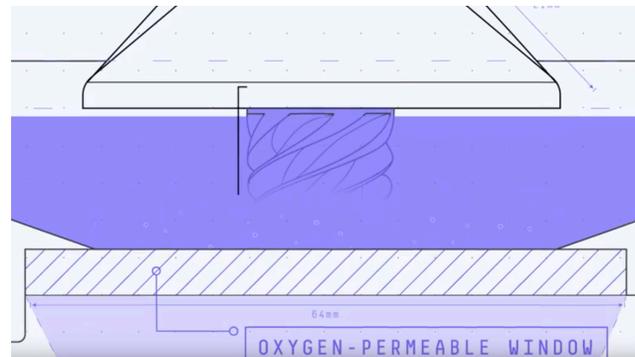
A leading U.S. micro plastic injection molding company, Makuta provides high-precision micro mold tooling and injection molds millions of zero-defect micro parts each month for customers in the medical, pharmaceutical, microfluidics, electronics/office automation and automotive industries.

“The addition of Carbon digital manufacturing technology has enabled us to offer customers fast, cost-effective prototypes and limited production runs of small and complex parts, larger than the micro-sized parts we injection mold,” Kaplan said. “Further, due to Carbon’s innovative technology, these are high-performance ‘working prototypes,’ with similar quality to injection molded parts and superior structural integrity and surface finish when compared to 3D printing.”

## The Technology

At the heart of the Carbon Digital Manufacturing Platform is Carbon Digital Light Synthesis™ technology, a software-controlled process that uses light and oxygen to grow parts from a pool of resin.

Carbon’s innovation is enabled by breakthroughs in software, hardware and materials, including a unique oxygen-permeable window that enables parts to be built continuously, resulting in superior mechanical properties — a departure from layer-by-layer builds associated with other additive technologies.



*A video of the process can be found at [makuta.com/small-complex-part-prototypes](http://makuta.com/small-complex-part-prototypes)*

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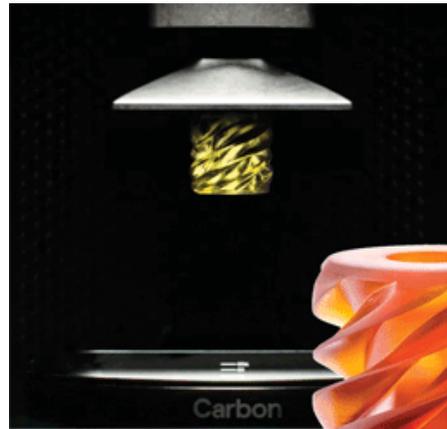
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While traditional 3D printed parts can be weak or brittle due to the layered printing, parts produced with Carbon's technology are isotropic with the mechanical properties of an injection molded engineering grade resin.

Carbon DLS™ technology also allows for the production of end-use parts at unmatched speed: up to 100 times faster than other additive manufacturing processes.

### Substantial Benefits for Customers

"The benefits for customers of this prototyping technology are substantial," said Tyler Adams, Vice President of Makuta. "Compared with typical injection molding prototyping to get working parts, this technology has a very fast turnaround time and no tooling costs. Those are also significant advantages for parts with low production requirements or that need individual customization such as dentures. Additionally, from a product development perspective, if you need to adjust the design, there's no waiting or added cost for revised tooling. We've even seen some complex geometries and part consolidation capabilities that this technology has tackled that would be impractical, if not impossible, for injection molding."



*This fully cured Cyanate Ester compressor rotor delivers high temperature resistance, strength and stiffness, similar to 15% GF Nylon. Carbon produced this part at a fraction of the cost of the CNC alternative.*

### Available Resins

Carbon offers a wide selection of high-performance resins that includes:

- A medical Polyurethane that is biocompatible and can be sterilized
- Polystyrene-like resins (Urethane Methacrylate family)
- A soft-touch, biocompatible Silicone-Urethane
- Tough, abrasion-resistant Polyurethanes similar to ABS
- Cyanate-Ester resins with high strength and temperature resistance, similar to 15% GF Nylon
- An Epoxy that is similar to 20% GF PBT
- Elastomeric Polyurethanes similar to TPU
- A tough, impact and abrasion resistant, flexible Polyurethane, similar to Polypropylene
- Eight types of denture-related resins

### Part Suitability

Industry wide, a diverse range of parts are currently being produced using the Carbon Digital Manufacturing Platform including medical device components, consumer product components, automotive components (Ford and Lamborghini), Riddell SpeedFlex Diamond Precision-Fit football helmet liners, Adidas Futurecraft 4D shoe midsoles and FDA-cleared dentures, to name just a few.

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Using Carbon DLS™ technology, Makuta will be able to produce working prototypes and limited-run production parts from roughly the size of a pea up to a size smaller than a shoebox, although many factors can affect suitability. Parts that are well suited include air and fluid manifolds, parts with fine features or textures, un-moldable geometries (such as complex lattices) and applications where part consolidation is desired.

For parts about the size of two fingers (1 x 2 x 3 inches), 10 to 20 parts could be produced per build cycle making the part especially well-suited for limited run-production.

“Parts with a wall thickness less than 2.5 mm would need to be designed with support. Parts with a sub 1 mm wall thickness would be unsuitable,” said Adams. “However, the great thing about our partnering with Carbon is that on the micro side of the scale, our core business, micro injection molding, picks up where the Carbon technology isn’t applicable — namely micro-sized parts, including very thin walls and exceptionally tight tolerances. It’s a great fit for us and our customers.”

By comparison, Makuta’s micro molded parts can have features as small as 20 microns and hold tolerances to +/- 5 microns. The smallest part the company has molded, for example, is an electrical bobbin that is smaller than a sesame seed, measuring just 1.11 by 0.96 x 0.64 mm. And while tooling is required for working prototypes of these exceptionally small parts, Makuta uses core blocks and multiple inserts that are easier and more cost effective to replace or modify.

“Our partnering with Carbon has increased the number of highly effective solutions we can provide,” said Kaplan. “We can review your micro-to-small part design and recommend the best solution based on your design, production, delivery and cost-containment requirements.”

#### **About Makuta, Inc.**

Founded in 1996, Makuta Micro Molding is 100% U.S. owned and operated. The company provides high-precision micro mold tooling, micro injection molded parts and high-performance prototyping of small plastic parts. Its 24/7 plastic injection molding facility, located in Shelbyville, IN, is ISO 9001 certified, Class 8 clean room certified (ISO 14644-1:2015), audited to ISO 13485 medical and temperature controlled to 72°F (22.2°C) 365 days per year.

In 2019, Makuta became a Certified Production Partner of Carbon, Inc., enabling the company to offer high-performance small-sized plastic parts prototyping and limited production runs using Carbon’s Digital Light Synthesis™ (DLS™) technology.

Makuta, Inc. is a member of the Sansyu Group of micro molders, the oldest and largest micro injection molding company in the world. In addition to Makuta, the Sansyu Group has eight other facilities: two production facilities and one mold making facility in Japan; one production facility in Hong Kong; a design and prototype facility in Singapore; two production facilities in Indonesia; and one production facility in the Philippines. The Group runs over 500 high-precision Sumitomo micro injection molding machines. As a member of the Sansyu Group, Makuta has access to unique research and technology that can be specifically tailored to meet customers’ requirements worldwide.

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Additional information on Makuta, Inc. can be found at [makuta.com](http://makuta.com).

Additional information on Carbon, Inc. can be found at [carbon3d.com](http://carbon3d.com).

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PR Contact: Susan Hunt Levin  
PH: (216) 932-3168  
Email: [s.hunt.levin@gmail.com](mailto:s.hunt.levin@gmail.com)