

Medical Device Design & Manufacturing



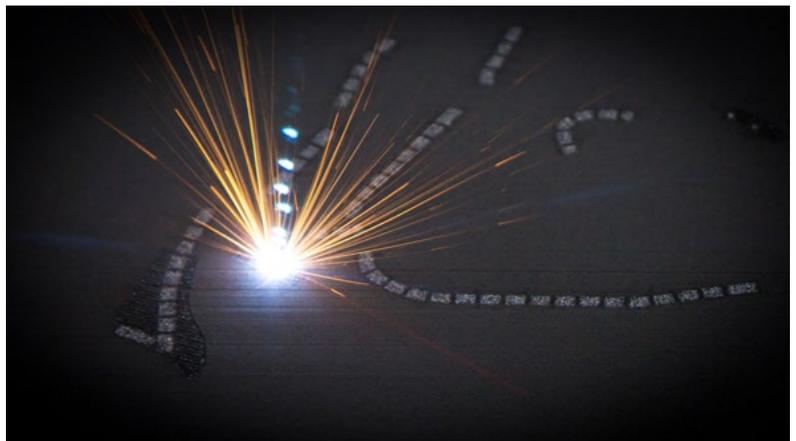


Overview

3D printing technology is at an inflection point with the medical device industry rapidly adopting 3D printing technology. This allows the introduction of new products that are revolutionizing medical device design and manufacturing. 3D Systems is at the forefront of this partnership with the industry by enabling new product innovation for precision healthcare applications.

Two world class ISO 13485 certified and FDA registered facilities are strategically located in Denver, CO and Leuven, Belgium. These sites offer a wealth of experience in 3D printing, engineering, quality and regulatory requirement support.

3D Systems specializes in partnering with industry leaders to accelerate new product introduction to the market. As we utilize our own state-of-the-art printing platforms to develop and commercialize these products, our business model allows for a smooth regulatory and logistics transition in cases where a customer wants to purchase these printers for in-house manufacturing of the products.



Medical Device Design & Manufacturing – enabling new product innovation for precision healthcare applications.

Medical Devices

3D Systems has manufactured more than 500,000 medical device implants for our partners. From the very first FDA cleared 3D printed titanium implant to development of the next generation of designs and 3D printing technology, 3D Systems has a proven track record and is the partner of choice for design and manufacturing. The state-of-the-art ProX® DMP 320 platform is used to provide best-in-class material properties and surface resolution for metal parts.

Orthopaedic

3D printed titanium implants exhibit excellent mechanical properties to make the difference in demanding orthopaedic applications.



SHIFT FROM 3D PRINTED PROTOTYPING TO 3D PRINTED SERIAL PRODUCTION

- Produce implant prototype variants to evaluate implant concepts and sizes.
- Finalize the implant design, and 3D print it in a variety of batch sizes.
- The 3D printing process yields cost-effective manufacturing of many implant types, and is fully compatible with classical (CNC) manufacturing. Furthermore, 3D Printing's shorter lead times enable lower inventory cost.

Mechanical properties of 3D Printed parts comply with all relevant standards for medical implants.

Serial-produced joint implant with integrated bone scaffold:

- Improves initial stability (faster patient recovery)
- Real osseointegration improves long term stability



Note: Images shown are demonstrations of 3D Systems' range of capabilities and are not available for sale.

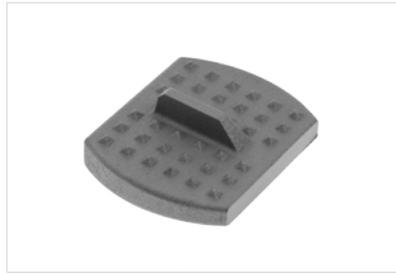
Spine

Implant developers can add increased functionality to their spinal implant designs

- Titanium fusion implants can incorporate complex porous features.
- High strength titanium alloys allow for inspection windows in the implant sidewalls for evaluation of implant integration with host tissue



Spinal cage

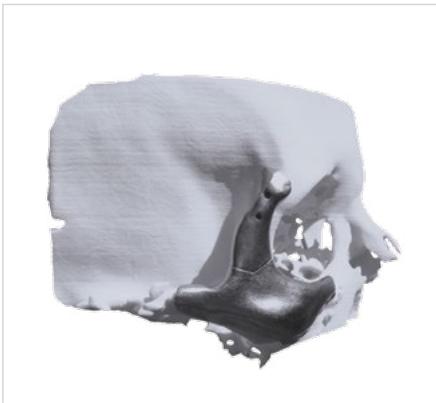


Artificial disk end plate



Scoliosis brace

Craniomaxillofacial



Designed to perfectly fit the obstructed zone, the zygoma reconstruction corrects the patient's facial asymmetry.



The world's first complete 3D Printed mandibular implant demonstrates how the most complex freeform geometries can be produced as a single part.



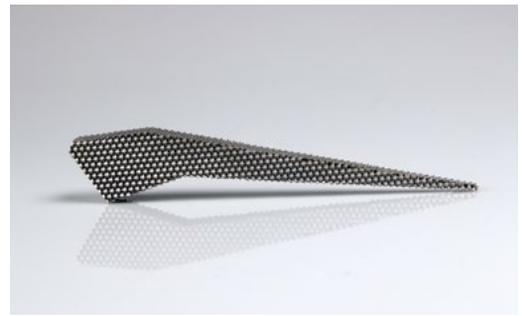
Patient-specific cranial reconstructions

Surgical Instrumentation

3D printing can be used for the manufacture of single use disposable surgical instruments, patient matched surgical guides, and other patient contacting medical devices. 3D Systems uses stereolithography, selective laser sintering and direct metal printing technologies to produce medical devices that are biocompatible and sterilizable from our facilities located in Denver, CO and Leuven, Belgium. Validated processes and a robust quality management system ensure repeatability and reliability of medical devices produced using 3D printing technology.



Single-use disposable surgical instruments (above, top right)

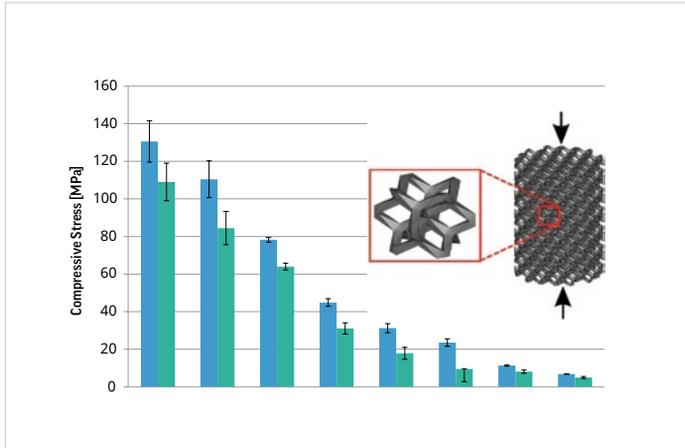


Re-usable surgical instrument

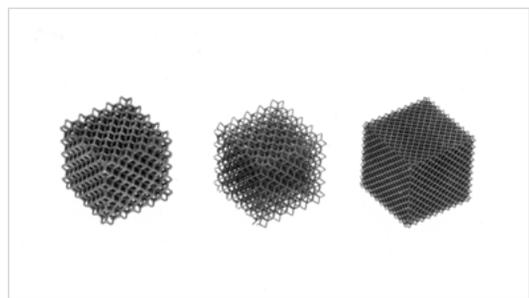


Porous Bone Replacement Materials (Bone Scaffolds)

- Designed porosity
- Full control over porosity degree and interconnectivity
- Various unit cell designs
- Can be integrated into all implant designs



Biocompatible 3D Printing Materials:	
Titanium Grade 1 and 2	Pure Ti, low oxygen
Titanium Grade 5	Ti6Al4V
Titanium Grade 23	Ti6Al4V ELI
Stainless Steel	316L
Stainless Steel	17-4 PH
Cobalt-Chrome	ASTM F75



3D Printing: Empowering Your Creativity

Chuck Hull, 3D Systems' Founder and Chief Technology Officer, invented Stereolithography 30 years ago. Innovation continues with seven print engines and more than 100 materials ranging from high-precision plastics to advanced metals. Precision healthcare applications include patient-specific anatomical models, instrumentation, surgical guides and implants.

Healthcare Solutions

3D Systems is a pioneer for healthcare solutions that improve outcomes which benefit both patients and surgeons. Our global team works with customers to help navigate technologies and provide support for surgical planning, training, device design, personalized medical technologies and 3D printing. We are dedicated to helping medical professionals train for, plan and practice complex medical procedures.

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3D Systems

5381 South Alkire Circle
Littleton, CO 80127 USA
Tel +1-720-643-1001
healthcare@3dsystems.com

Grauwmeer 14, Leuven
Belgium
Tel +32-1694-6400
info.leuven@3dsystems.com



3 Golan Street (Golan Building)
Airport City, 7019900 Israel
Tel +972-3-911-4444
healthcare@3dsystems.com