

# Medical Device Design & Manufacturing

Comprehensive product development and additive manufacturing solutions to support implant and instrument performance

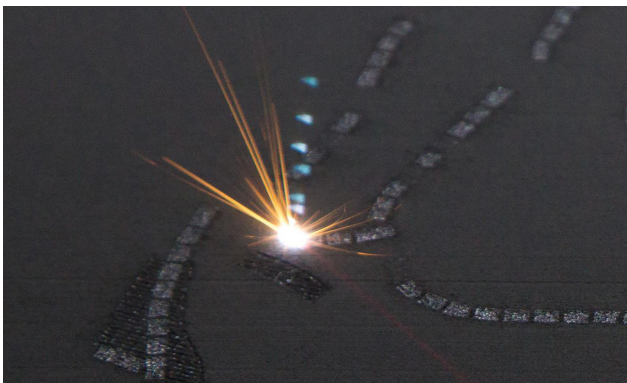




## Empowering the Medical Device Industry

With experience in manufacturing more than 850,000 medical devices, beginning with the very first FDA cleared 3D printed titanium implant, 3D Systems provides an ecosystem of software, technology, services, and professional consultation, and is the top choice of the medical device industry. Its world-class, FDA-registered, ISO 13485-certified facilities—located in both North America and Europe—provide valuable expertise in 3D printing, engineering, quality control, and regulatory requirements. 3D Systems has supported customers from industry leaders to innovative startups in developing a diverse portfolio of groundbreaking precision healthcare applications and medical technology allowing our partners to bring revolutionary medical devices to market faster than ever before.

Being at the forefront of additive manufacturing, 3D Systems' development team is continuously innovating its technology and processes so partners can develop powerful new medical devices, quickly and cost-effectively. ProX® DMP 350 and 500 platforms are setting the benchmark in material properties and surface resolution for metal parts. 3DXpert™ software allows devices to be designed specifically for additive manufacturing, providing the ability to create complex porous structures typically could not be created through traditional subtractive manufacturing.



DMP Factory 350



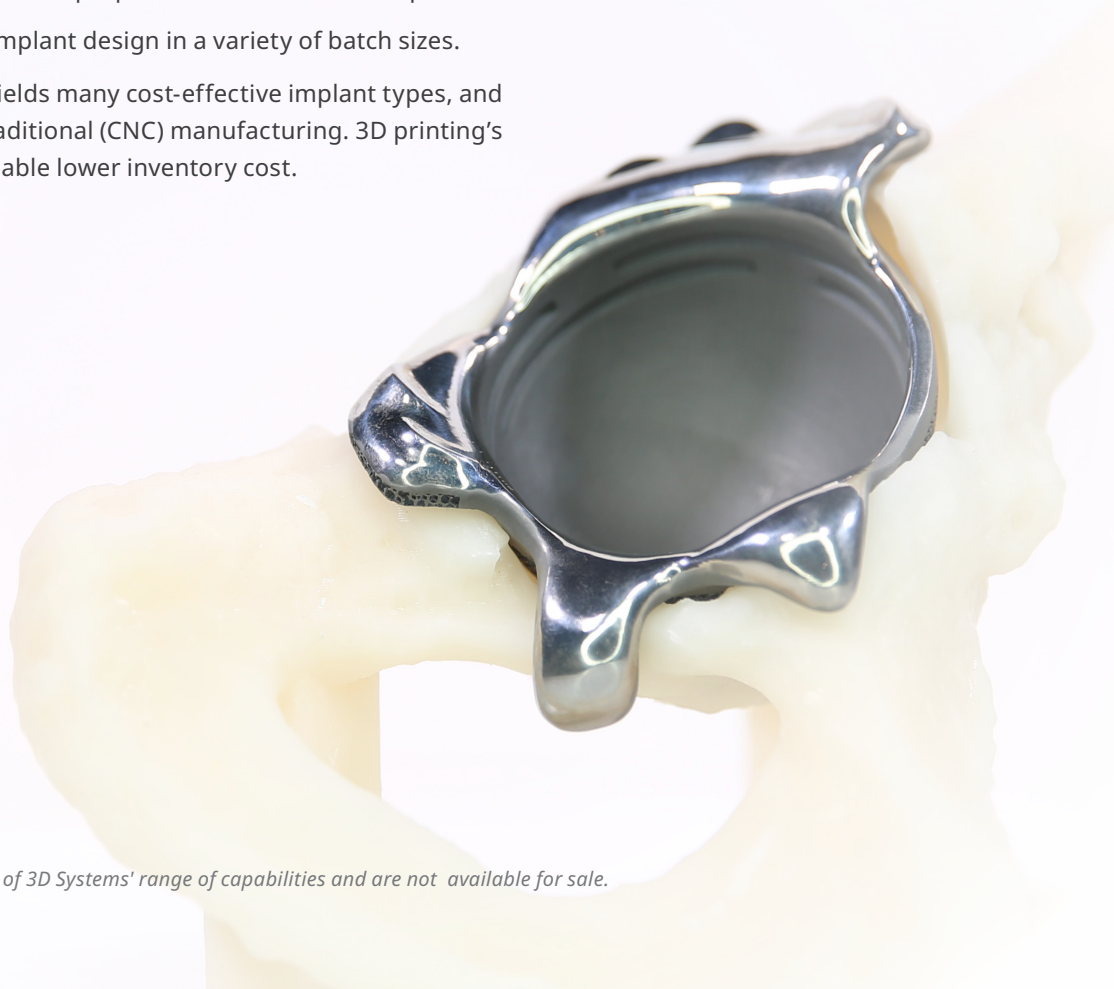
# Medical Device Design & Additive Manufacturing – bringing ideas to reality

## Orthopaedic Solutions

3D printed implants and surgical instruments exhibit excellent mechanical properties enabling accelerated product development without the long lead-times associated with traditional subtractive manufacturing.

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

- Produce implant prototype variants to evaluate implant concepts and sizes.
- Validated parameter sets which allow for printing metallic parts that meet the ASTM Standards for mechanical properties and chemical composition.
- Finalize and 3D print the implant design in a variety of batch sizes.
- The 3D printing process yields many cost-effective implant types, and is fully compatible with traditional (CNC) manufacturing. 3D printing's shorter lead times also enable lower inventory cost.



Patient-specific  
acetabular device

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

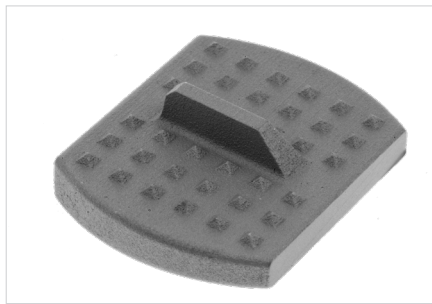
## Spine Solutions

3D Systems' technology and services allow implant developers to add increased functionality to their spinal implant designs. Our 3D printing technology is producing interbody devices with improved osteoconductive properties with the proven biocompatibility of Ti6Al4V alloy.

- 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.
- Superior fusion enabled by the production of complex lattices promote deeper bone ongrowth & ingrowth.



Interbody fusion device

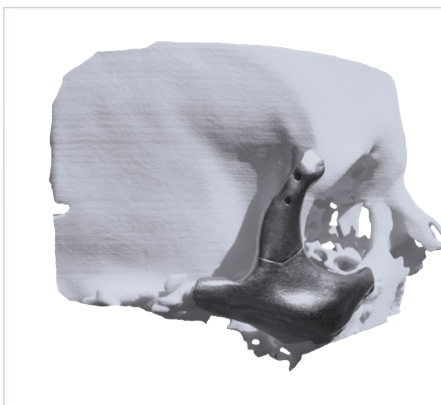


Artificial disk end plate



Lateral spinal cage

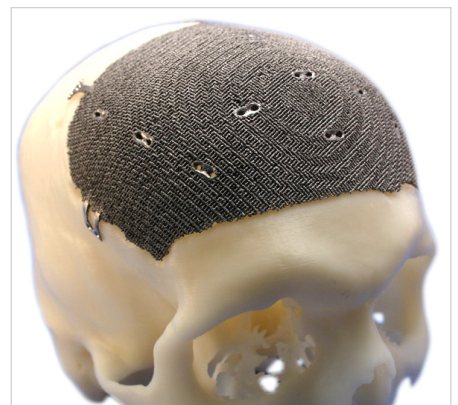
## Craniomaxillofacial Solutions



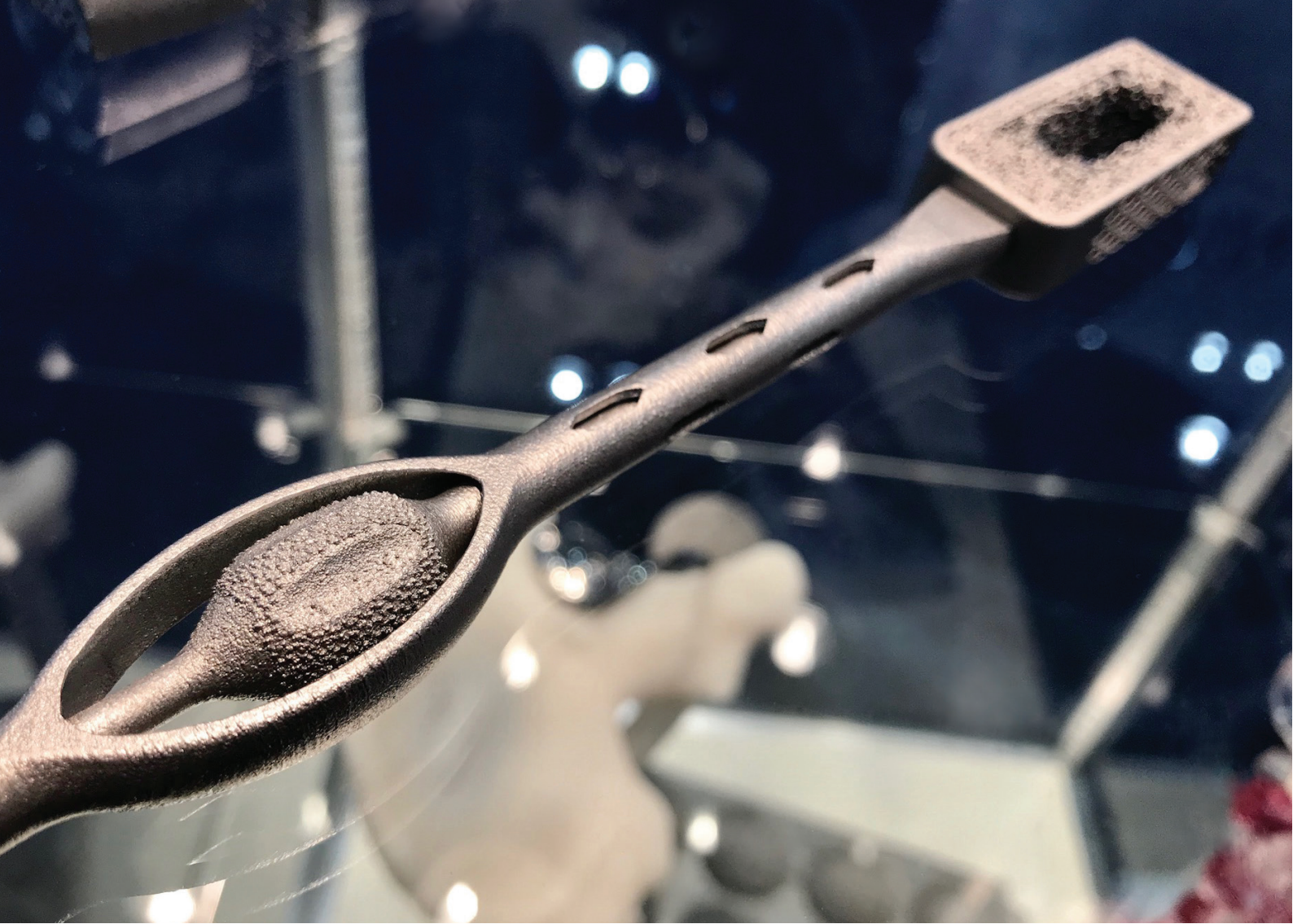
Designed to perfectly fit the obstructed zone, the zygoma reconstruction corrects the patient's facial asymmetry.



The world's first complete 3D printed mandibular implant demonstrates that the most complex free form geometries can be produced as a single part.



Patient-specific cranial reconstructions

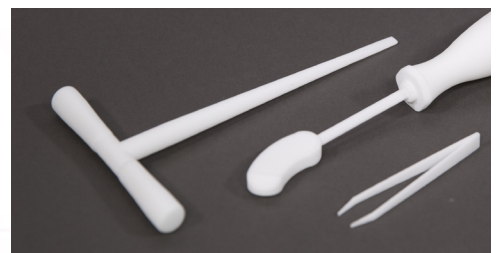


## Surgical Instrumentation

3D printing can be used to manufacture single-use disposable surgical instruments, re-usable 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 biocompatible, sterilizable medical devices. Validated processes and a robust quality-management system ensure repeatability and reliability of medical devices produced using advanced 3D printing technology to provide healthcare industries with new approaches to complex problems. 3D Systems has validated parameter sets released for instrumentation in 17-4PH, which meet mechanical and chemical properties for ASTM A564.



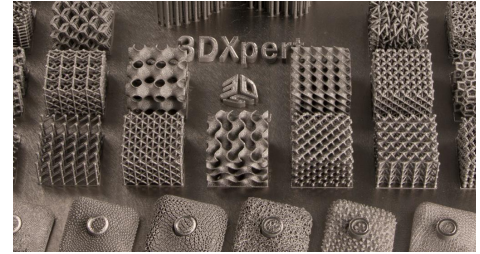
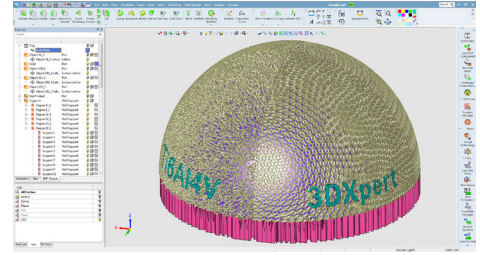
Re-usable surgical instruments



Single-use disposable surgical instruments

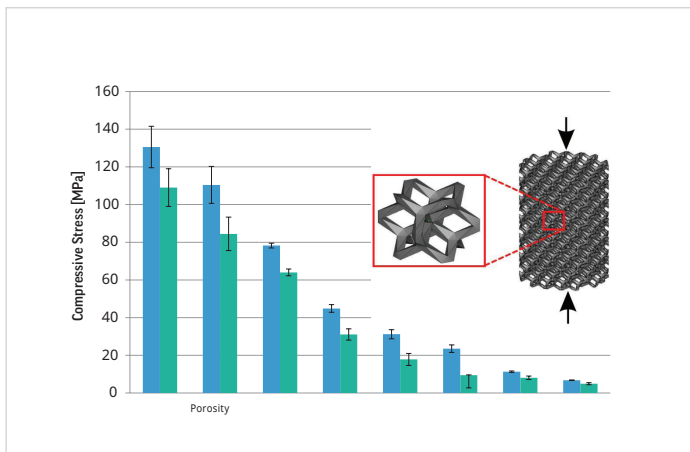
## All-in-one integrated software for additive manufacturing

Supporting every step of the additive manufacturing workflow from design to post-processing, 3DXpert streamlines your process to quickly and efficiently transition from a 3D model to a successfully printed part. 3DXpert reduces the time for supporting complex parts significantly and provides a wide variety of customizable support structures and scaffold opportunities.



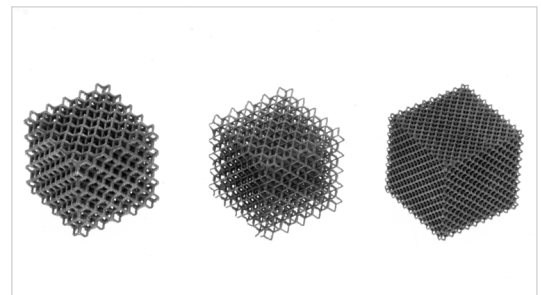
## Porous Bone Replacement Materials (Bone Scaffolds)

- Full control over porosity degree and interconnectivity
- Various unit cell designs
- Available for 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



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