Desktop Metal

Studio System™ 2

Designed for the office

The Studio System 2 was designed from the ground-up to fit into your team's workflow. With no solvents, no loose metal powders or lasers and very little operator intervention required, the system makes it easy to start printing metal parts - no third party equipment or special facilities required.

Easy, two-step processing

Making complex, high-performance metal parts has never been easier. Featuring a breakthrough two-step process, next-generation Separable Supports™, and a software-controlled workflow, the Studio System 2 makes it simpler than ever to produce custom metal parts.[1]

High-quality parts

Easily produce difficult-to-machine parts featuring complex geometry like undercuts and internal channels. Fabricate®, the software at the heart of the Studio System, automates complicated metallurgical processes to produce high-quality parts with densities and feature accuracy similar to casting.

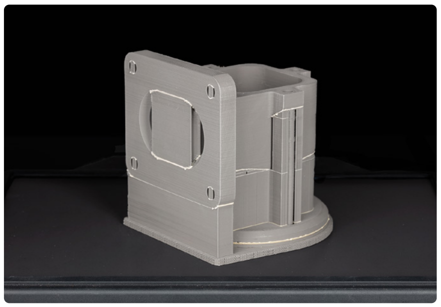
1. Unlike comparable metal 3D printing systems, Studio System™ 2 eliminates loose metal powders and features a two-step process (no solvent debind required) and features Separable Supports™ technology with strategic splits for hand-removable supports, hot swappable cartridges and removable printheads to make material changes easy, and a fully software-controlled workflow.

BMD Technology

The Studio System 2 is designed around the chemistry and powder supply chain of the Metal Injection Molding (MIM) industry. Leveraging this mature, multi-billion dollar global industry gives Desktop Metal customers proven and reliable metallurgy. The images below show how the Studio System 2 Hardware makes the Bound Metal Deposition™ (BMD) process accessible for users.

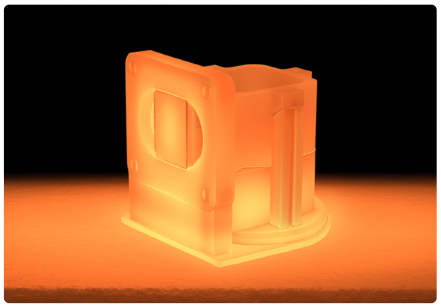
Specially formulated feedstock

The BMD process starts with specially formulated bound metal rods—metal powder held together by polymer binders—a formulation similar to the binder and metal powder mixture used in Metal Injection Molding (MIM).



Printing

The first step in each process is forming a "green" part. With BMD, the part's form is created by extruding bound metal rods layer by layer in a carefully controlled process. During printing, support structures are created that will stay with the part until they are removed by the user. To allow the support structures to easily separate from the part after sintering, a interface layer is printed between the part and the support structures.



Sinter

During sintering, the green part is first heated to a relatively low temperature where the binder is removed. Desktop Metal's specific binder formulation allows the part to maintain shape while the binder is removed from the entire cross section of the part. Then, the temperature is raised to just below the melting temperature of the metal alloy. At this elevated temperature (~1300 °C), metal particles fuse together causing the part to shrink in dimension and the material to densify up to 98%.

About Desktop Metal®

Desktop Metal® is accelerating the transformation of manufacturing with end-to-end 3D printing solutions. Founded in 2015 by leaders in advanced manufacturing, metallurgy, and robotics, the company is addressing the unmet challenges of speed, cost, and quality to make 3D printing an essential tool for engineers, designers, and manufacturers around the world.

_Highlights

- Over $438M in funding
- 200+ engineers, 25 Ph.D.s
- 4 MIT professors (co-founders)
- 100+ patents in process covering 200+ inventions
- Adopted by industrial companies
- 90+ resellers in 65 countries

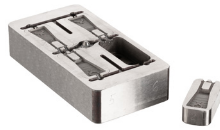
_Customers

- Google
- Ford
- MIT
- BMW
- Renault
- Nissan
- Bosch
- Toyota
- EATON
- Goodyear
- Protolabs
- INDO-MIM
- Applied Materials
- Continental
- TerraPower
- Owens Corning
- Medtronic
- Univ. of Texas at Austin
- Texas A&M Univ.
- Wentworth
- Politecnico Di Milano
- The Univ. of Sheffield
- Wilson Tool
- Milwaukee Tool
- Alpha Precision Group
- L3
- TECT Aerospace
- MITRE
- 3M
- Stanley Black & Decker
- Adidas
- Jade Group
- Christian Tse
- WEIR Group
- John Zink Hamworthy
- US Army
- US Navy
- US DoD
- Oak Ridge National Laboratory
- Knight Global
- The Hebrew Univ. of Jerusalem
- Lockheed Martin
- etc.

Key Use Cases

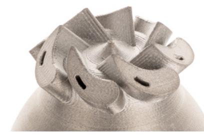

01
Functional prototyping

Quickly move from design to prototype using production grade materials. Rapidly test and iterate to accelerate product development timelines and improve time to market.

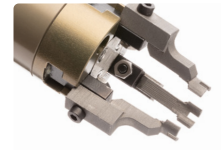
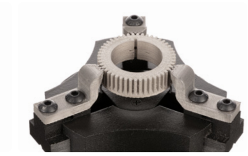
02
Manufacturing tools

Print tools to support a variety of molding, stamping, and extrusion applications. Utilize the near-net-shape capability of the Studio System 2 to produce tooling components with greatly reduced post-processing.




03
Low volume production

Replace cost-prohibitive setups and tooling, long lead-time castings and difficult machining operations by printing complex components directly with the Studio System 2.

04
Jigs & Fixtures

Streamline assembly, joining, and inspection operations on your shop floor with 3D printed components. Quickly manufacture complex jigs and fixtures that can stand up to extreme manufacturing environments.

Materials

The Studio System 2 is designed for multi-material compatibility and effortless material changes. Leveraging well-studied alloys from the Metal Injection Molding (MIM) industry, the Studio System 2 materials are specially formulated into safe-to-handle bound metal rods, resulting in less shrinkage and higher sintering density than alternative extrusion-based technologies.

_Studio System 2 Materials [1]

316L
Stainless Steel

17-4 PH
Stainless Steel

D2
Tool Steel

_Backwards-compatible Materials [2]

17-4 PH
Stainless Steel

H13
Tool Steel

4140
Low Alloy Steel

Copper
High Purity Copper

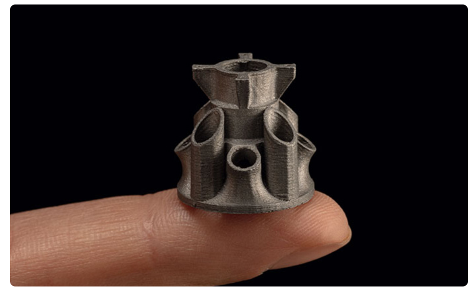
1. Materials shown in grey are expected to deliver in 2021.
2. The Studio System™ 2 is backwards-compatible with legacy materials with the purchase of a debinder.

Printer

Unlike laser-based systems that selectively melt metal powder, the Studio System 2 extrudes bound metal rods—similar to how an FDM printer works. This eliminates many of the safety requirements often associated with metal 3D printing while enabling new features like the use of fully closed-cell infill for lightweight strength.

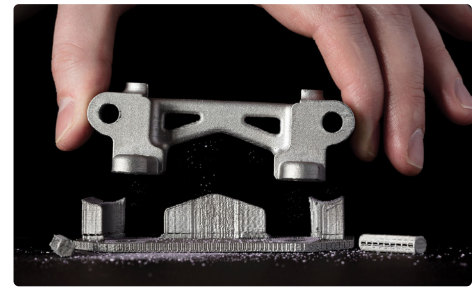
01
Bound metal rods vs. Filament

Bound metal rods allow higher loading of metal powder to binder as they do not require the flexibility of a spooled filament. Rods also enable Desktop Metal's unique "pusher" feed mechanism for increased part density.



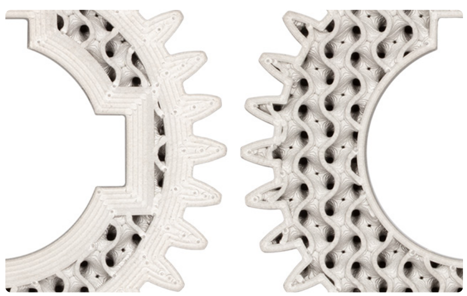
02
Variable resolution printing

Easily swapping between standard and high resolution printheads (400 vs 250 micron nozzle size) allows optimum build quality and process time for both small and large parts.



03
Ceramic release layer with anti-mold lock

Allows easy post processing of complex shapes; no cutting tools required to remove complex support structures.



04
Variable shell thickness

Parts printed on the Studio System 2 feature an interior lattice infill structure and exterior shell. User-adjustable shell thickness allows for the flexibility to achieve higher part strength and more room for post processing.

05
Fast and easy material changeover

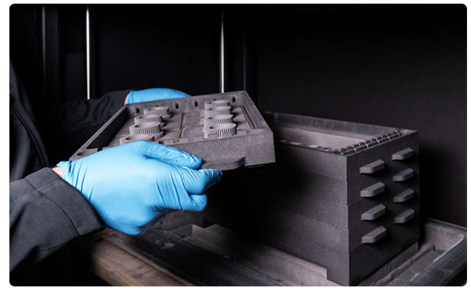
Quick-release printheads and easy-to-swap material cartridges allow material changes in a matter of minutes with no cross contamination.

Furnace

Designed to be the easiest to use sintering furnace made, the Desktop Metal Furnace first heats parts to remove all binders from parts, then ramps up the temperature to near-melting to deliver industrial-strength sintering in an office-friendly package. Built-in temperature profiles tuned to every build and material ensure uniform heating and cooling without the residual stresses introduced in laser-based systems.

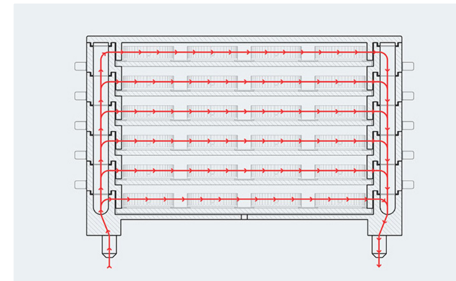
01
Large capacity and easy Access

The furnace opens at the touch of a button providing full access to its high-volume chamber - a full 200 x 300 x 200 mm workload envelope. Unlike tube furnaces, part placement and loading are quick, easy, and safe.



02
Advanced graphite retort design

An adjustable shelving system allows sintering of multiple levels of parts for efficient batch processing. Thermal uniformity and gas circulation are optimized with a plenum design tuned for all loading conditions.



03
Uniform temperature up to 1400 °C

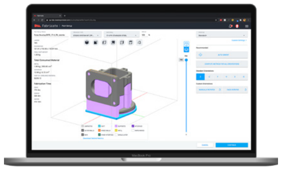
Multiple heat zones are used to achieve high temperatures and thermal uniformity(±5 °C). A 1400 °C max temp enables sintering of a wide range of metals to the highest densities achievable.

04
Low gas usage with flexible supply for low cost operation

Parts must be sintered in an oxygen-free environment to achieve good metallurgy. The Desktop Metal Furnace uses a vacuum to eliminate oxygen from the furnace chamber. This drastically reduces the volume of gas consumed during sintering. Gas is supplied in small bottles or can be piped to larger supply tanks or a house gas line.

05
Vapor management (vacuum pump and binder trap)

As parts are heated in the furnace, all polymer binder remaining in the part is converted to vapor as temperatures rise. Vapors are condensed in a fully integrated binder trap container at the rear of the machine for easy disposal.



Fabricate®

Fabricate® software provides an intuitive guide for the user throughout the entire metal 3D printing process. From simplified model prep to creation of sintering cycles, it applies knowledge from world-leading materials scientists and metal 3D printing experts. This takes the guesswork out of achieving high-quality parts with good metallurgical properties.

01
Simplified model preparation

The software guides users through file preparation and optimizes fabrication settings based on user-defined goals.

- Accepts native CAD files or STL for highest fidelity processing
- Shrink factors are calculated in all dimensions
- Optimum build orientation suggested for all process steps
- Interactive toolpath preview
- Supports and interface layers automatically generated

02
Expert metallurgy built-In

Integrated with intelligence from world-leading material scientists and 3D printing professionals, Fabricate® applies expert metallurgy at every step in the process and optimizes fabrication to render high-quality metal parts.

03
Live tracking & alerts

Track parts as they move through fabrication. Fabricate® monitors supply levels and notifies users if there is an issue before initiating the cycle.

04
Automated processing of print & sintering Steps

Fabricate® automates even the most challenging aspects of the fabrication process to ensure part quality while eliminating operator burden. Fabricate® sends instructions to each device for processing.

- Generation of Separable SupportsTM to eliminate Mold-Lock
- Calculated sintering times for efficient batch processing.
- Auto-generated sintering profiles
- System monitoring & live updates

05
Cloud connected or local software

The three-part system is integrated with Fabricate® via a secure, cloud-based platform to enable:

- Multi-device management
- Automatic software updates
- Remote support

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Studio System™ 2 Specification

[Printer]

Reliable BMD extrusion-based print technology	
Support technology	Separable Supports™
Interface technology	Ceramic Release Layer™
Nozzle diameter (Build media)	• 0.40 mm, standard resolution • 0.25 mm, high resolution
Layer height (in green state)	• 50-150 µm, high resolution printhead • 150-300 µm, standard resolution printhead
Max build weight (in green state)	6.5 kg (14.3 lbs)
Build envelope	300 x 200 x 200 mm (12 x 8 x 8 in)
Build chamber	Heated
Build Plate	• Heated, up to 70 °C (158 °F) • Vacuum-enabled print bed
External dimension	948 x 823 x 529 mm (37.3 x 32.4 x 20.8 in)
Weight	97 kg (214 lbs)
Power requirements	100-130 VAC, 50/60Hz, 15 A, 1-phase 200-240 VAC, 50/60Hz, 10 A, 1-phase

*Build volume applies to printers with part number BMD-PP0006

[Furnace]

Atmosphere	Partial-pressure sintering (vacuum-enabled)
Max temperature	1400 °C (2552 °F)
Thermal uniformity	±5 °C at sintering temperatures
Gas types	Forming gas, Argon (material dependent)
Gas connection	External gas connection
Workload envelope	300 x 200 x 200 mm (11.8 x 7.9 x 7.9 in)
Workload surface area	3,000 cm² (465 in²)
Workholding	Adjustable multi-level trays with ceramic setters (6-position)
Retort	Stacking graphite rings
External dimension	1618 x 1380 x 754 mm (63.7 x 54.3 x 29.7 in)
Height in open position	2160 mm (85.0 in)
Weight	798 kg (1,760 lbs)
Power requirements	208 VAC, 60 Hz, 30 A, 3-phase dedicated circuit
Ventilation	• Effluent air exhaust line (0.5 in, push-to-connect) • Liquid drain line (0.5 in, push-to-connect)

[Fabricate®]

Manages part fabrication process through each piece of equipment
Compatible with most native 3D CAD design files or .stl files
Cloud functionality allows remote monitoring
Local option allows operation without need for internet access