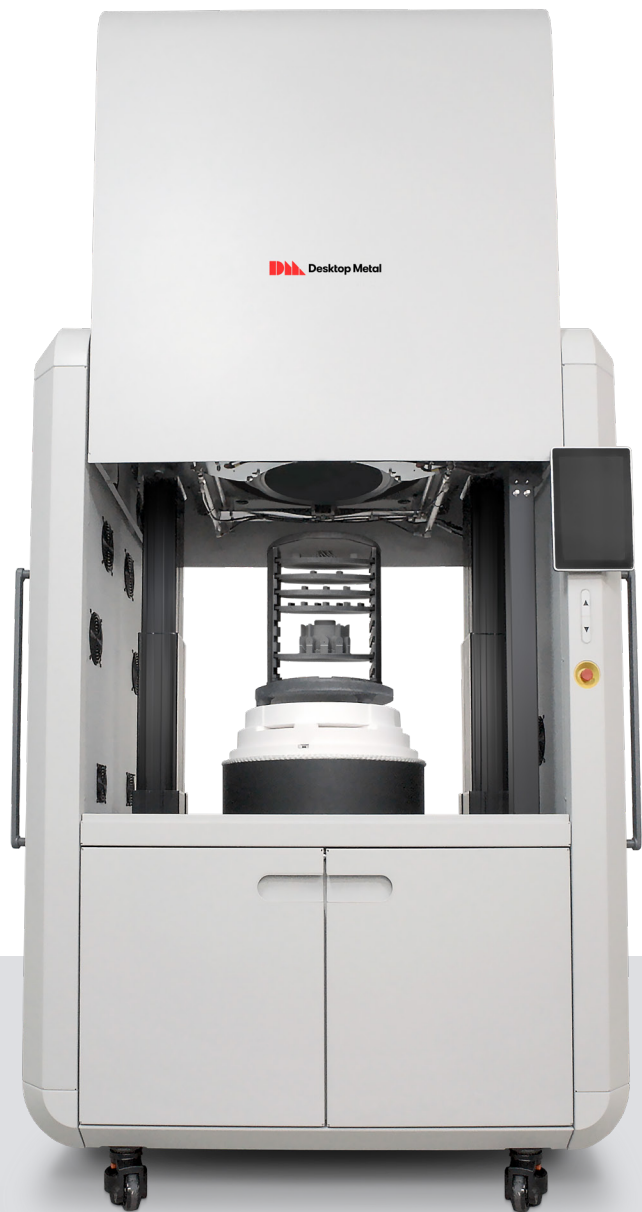


# PureSinter™ Furnace

**High Purity. High Efficiency.  
High Reliability.**

This all-new vacuum furnace for combined debinding and sintering features breakthrough industrial performance at an affordable price

**Ti-Tested™  
for purity**



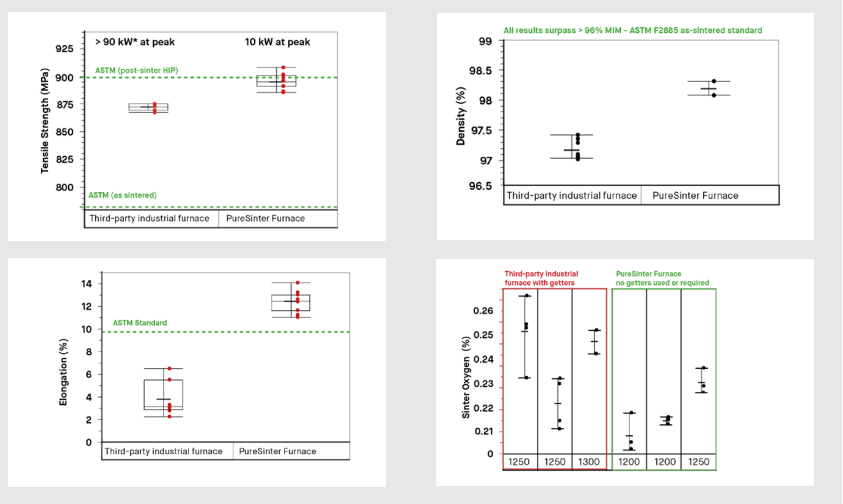


### Dial In Your Metallurgy

PureSinter delivers improved density and, depending on material, improved properties compared to premium, third-party vacuum furnaces that require much more energy to operate.

With Ti6Al4V, the PureSinter furnace delivered higher part density at >98% than the traditional third-party vacuum furnace and tensile strength performance results approaching the ASTM standard for a post-sintered HIP part with much less power and without the additional requirement of a HIP step.

Similarly, PureSinter also delivered elongation results on Ti6Al4V surpassing the ASTM standard compared to the traditional furnace. What's more, PureSinter picked up dramatically less oxygen without getters than the traditional vacuum furnace using getters.



# A BREAKTHROUGH FURNACE FOR SIMPLIFIED SINTERING

*A cleaner furnace is a simpler, more reliable furnace — because, simply put, there are fewer contaminants to gunk up the process*

Most sintering furnaces today are grossly contaminated. Residue from debinding bound parts collects and embeds itself in the insulation of traditional cold walls, which are usually cooled with water.

This highly visible contamination causes a devil of undesirable chemical reactions in the furnace — reactions that have challenged sinter-based manufacturing industries since their inception.

Indeed, the black art of metallurgical processing in Powder Metallurgy (PM) and Metal Injection Molding (MIM) has been not just understanding, and correcting for, the complexities of sintering deformation, but also finding a sweet spot in this myriad of residue-induced chemical reactions.

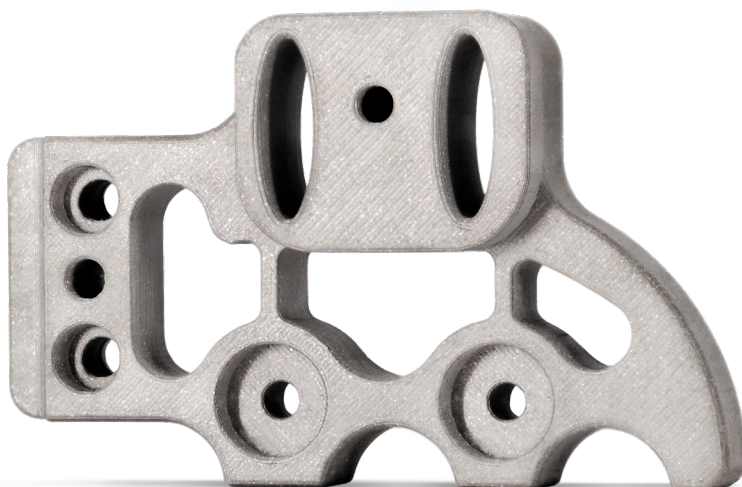
As the leaders in sinter-based Additive Manufacturing (AM), Desktop Metal has dedicated significant time and resources to understanding and rethinking these challenges from their very roots, so we could develop solutions that make sintering easier, faster, and more reliable.

Just as our popular Live Sinter™ simulation software predicts and corrects for sintering deformation, our new PureSinter™ Furnace — years in the making — is a breakthrough for cleaner, more efficient, and reliable sintering.

Importantly, PureSinter is designed as a total industry solution — not just for sinter-based AM, but also for PM, MIM, and other sectors that could benefit from a compact, high-purity vacuum furnace.

If you're just getting started with sinter-based manufacturing technologies, all you need to know is that PureSinter is a clean, modern, and reliable furnace that works — giving you less to think about.

If you're a sintering pro, we think you'll appreciate how we've rethought furnace design to raise the bar for vacuum furnaces. In testing with Ti64 — one of the most reactive and contamination-prone metals — we've verified the purity and repeatability of PureSinter for consistent results, cycle after cycle.



Reactive materials are challenging to sinter, traditionally requiring expensive vacuum pumps, gas purifiers, and burnout cycles. PureSinter has sintered titanium to 98% density with properties that meet or exceed ASTM F2885 standards for HIPed PM Ti6Al4V material while using a much smaller energy footprint than conventional sintering furnaces.

This end effector was lightweighted with a 3D printed titanium design. Alpha Precision Group reduced lead time and cost for the part that holds a camshaft during an induction heat treatment process.



# THE PURESINTER FURNACE

## Built for ease-of-use, performance, and reliability

This affordable, state-of-the-art furnace features an all-new design that was rethought from the ground up with an innovative vacuum retort approach to deliver ultra-high levels of purity and solve the challenges of traditional vacuum furnaces.

PureSinter delivers the highest quality sintered parts, on par or better than industrial furnaces with higher acquisition and operating costs. Even titanium can be easily sintered with a high degree of confidence without the complex preparations required with other furnaces. PureSinter is Ti-Tested™ with excellent results.

### Vertical Furnace Design

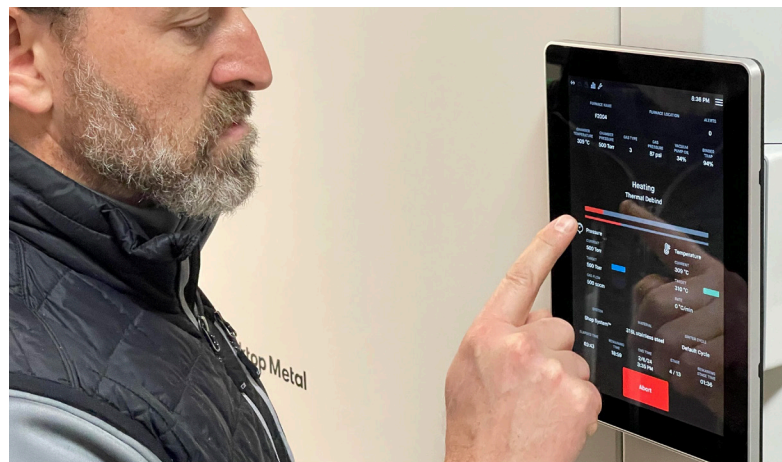
The first thing you'll notice about PureSinter is the vertical design with a **Thermal Hood** that lifts up and down. The hood contains insulation, 12 standard resistive heating elements, and also supports a silicon carbide (SiC) **Vacuum Retort** dome. Load and unload parts when the hood is up and, when you're ready to sinter, lower the hood, which seals the vacuum retort. With PureSinter, there are no doors (or internal boxes) to close and seal. All up-and-down operation is done with the touch of two-hand control buttons for safety.

### Modern User Experience

PureSinter offers a modern touchscreen to guide users through operation and maintenance and access pre-programmed furnace parameters for Desktop Metal materials and systems<sup>1</sup>, or program your own. The touchscreen, in combination with the machine's Thermal Hood controls, also raises and lowers the hood. Once the hood is open, you'll have unparalleled visibility into your furnace from either the front or back, eliminating the confined feeling of most traditional furnaces. Behind the machine's lower doors, you'll find an easily accessible binder trap.

### Active, Rapid Cooling

The furnace features a total of 17 fans and a pop-out ceiling vent for active, rapid cooling and fast cycle times. Importantly, PureSinter does not utilize cold walls with an expensive water-cooled jacket. As experienced furnace users know, cold walls are collection points for debinding residue and contaminants. Instead, our unique Vacuum Retort design uses a breakthrough hot wall design.



### Simple Sintering Software

The Desktop Metal PureSinter Furnace comes standard with **Live Sinter** software<sup>2</sup> to produce design files for geometries that can be pressed, molded, or 3D printed and sintered to perfection. Our easy-to-use multi-physics simulation software predicts part behavior during sintering and automatically compensates for distortion and other effects. It also enables users to further refine results with easy scan-based adjustments, in addition to other helpful features.

### High Efficiency = Low Operating Costs

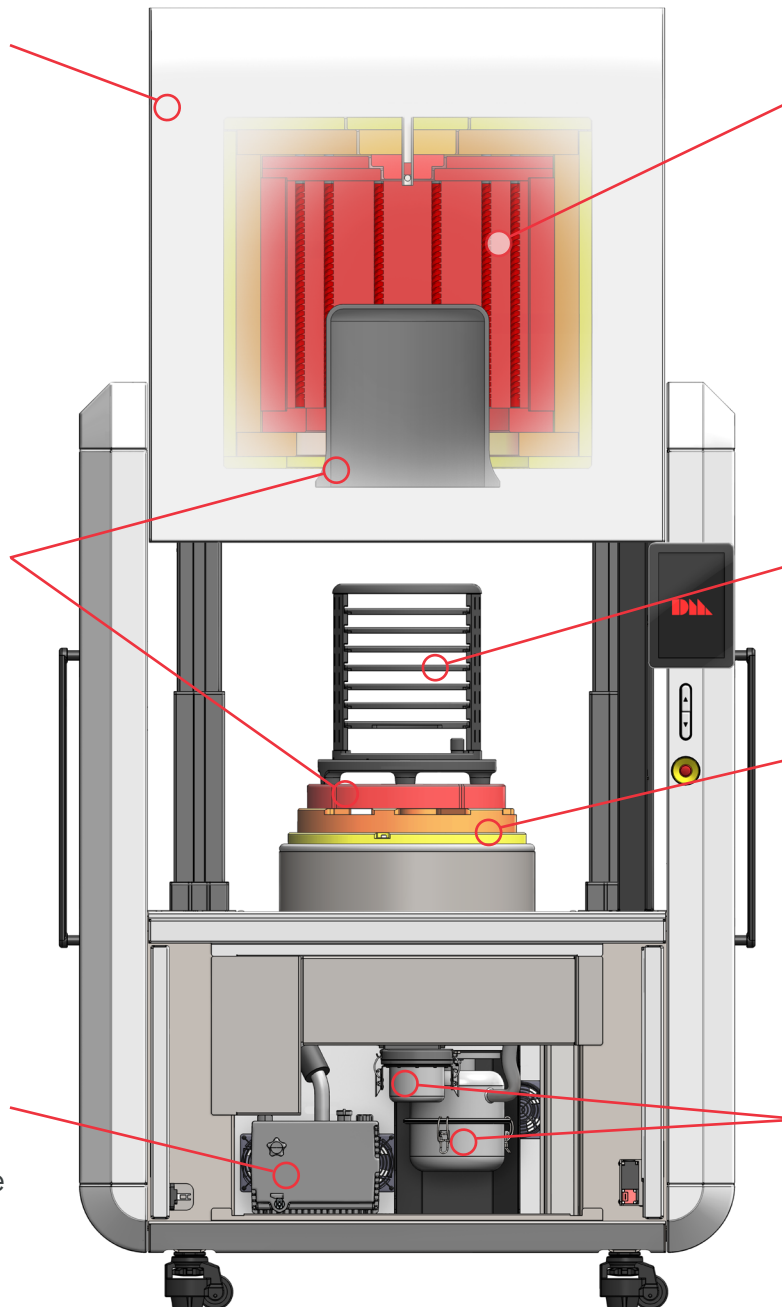
With a high-purity seal and an efficient cooling system, the energy requirements for the PureSinter furnace offer a dramatic improvement over other traditional furnaces that it competes with on performance. The electrical requirements are 200-220 V, 40A, 3ph, 50/60Hz or 380-415V, 20A, 3ph, 50/60Hz.

## PURESINTER FURNACE OVERVIEW

The **Thermal Hood** lifts off the hearth with dual vertical actuators, revealing unparalleled visibility and access into the retort from the front and back. When lowered, it automatically creates a high-purity retort seal

An all-new **Vacuum Retort** consists of a dome and pedestal made in SiC that is durable, thermally conductive, and inert. The touch-free dome is automatically lifted from the retort base with a clamp mounted in the Thermal Hood

With closed loop pressure control, the **Vacuum Pump** delivers a partial pressure atmosphere inside the Vacuum Retort of 5-500 Torr



An array of 12 **Standard Resistive Heating Elements**, surrounded by insulation, are built into the Thermal Hood and surround the silicon carbide (SiC) Vacuum Retort for tight temperature uniformity during debinding and sintering

**High-Purity Graphite Shelving** offers 7 shelves and 15.8L of usable volume.

A round, stepped **Insulating Platform** features alumina-silica and fiberglass layers on the exterior of the Vacuum Retort that mate with the insulation in the Thermal Hood when closed

An easy-access **Binder Trap** is located behind the double doors within the system's base

## PureSinter Operating Performance

### Compatible Process Gases

- Argon
- Nitrogen
- Forming Gas
- Air (<400°C)

*Single gas inlet on back of furnace*

Maximum temperature  
1,420°C

Temperature uniformity  
±5°C @ 1,420°C steady-state

Cooling rate  
1,420°C to opening in <4 hours

Maximum Power Draw  
~13 kW

Steady State Holding Power at  
1,420°C  
~7 kW



# ALL-NEW RETORT DESIGN

## Hot walls and a breakthrough design keep the retort clean

In traditional vacuum furnace design, the vacuum chamber contains all the insulation, heating elements, and retort components. That's the same design approach our original furnace, launched in 2017, used as well.

Since then, we've learned a lot to make us rethink that approach. For PureSinter, we've put the heating elements and insulation outside the vacuum retort so that trace elements of oxygen, water vapor, and binder cannot contaminate the retort environment. While that sounds simple, it took some major innovations in furnace design to achieve it.

### *Reinvention Required*

A breakthrough new retort design with three critical requirements was needed: an oxygen-tight seal, durability for repeated vacuum cycles, and high thermal conductivity for uniform temperature distribution.

Most retorts today are not designed to be airtight. Built from porous graphite or expensive metal plates, they allow contaminated gases to circulate throughout the chamber.

PureSinter prevents  $O_2$  molecules from slipping past seals and into the sintering chamber, allowing only the processing gas into the hot vacuum retort.

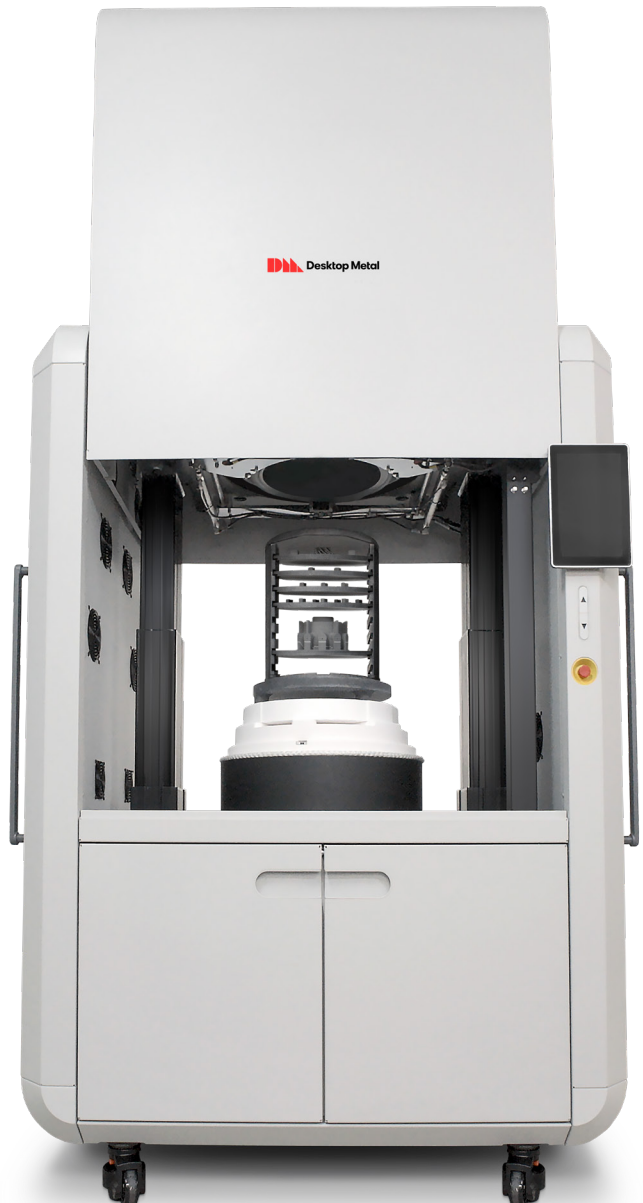
Our approach was enabled by:

- a specially designed retort — base and dome — built in high density silicon carbide, a material known for its high thermal conductivity and strength, and low thermal expansion
- a Pecclet gas flow seal and flexible graphite gasket at the mating surface of the base and dome, shielding parts from all oxygen and other contaminants that try to enter the retort

Surrounding the sealed vacuum retort, the Thermal Hood contains the heating elements and insulation.

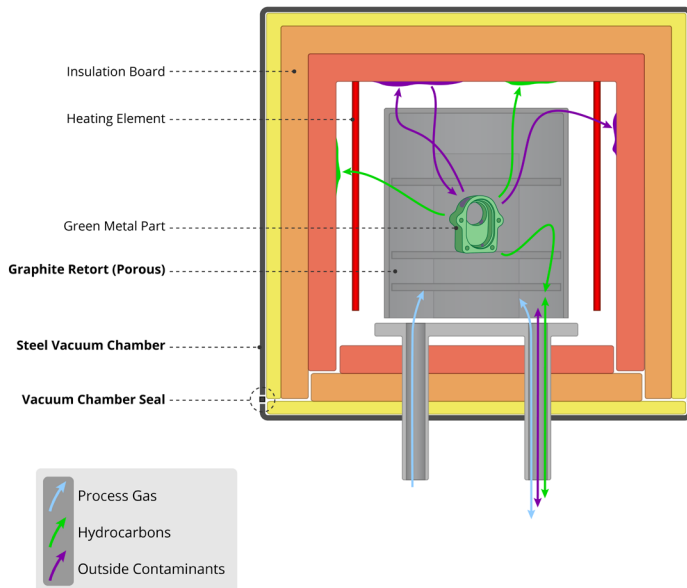
Instead of cold, water-cooled walls that residue can collect on, PureSinter uses energy-efficient fans to rapidly cool the Vacuum Retort. This allows PureSinter to stay extremely clean and contamination free.

In testing with Ti64, one of the most reactive and contamination-sensitive metals, we've repeatedly verified the cleanliness of this revolutionary design. Ultimately, a cleaner furnace means a more reliable furnace.



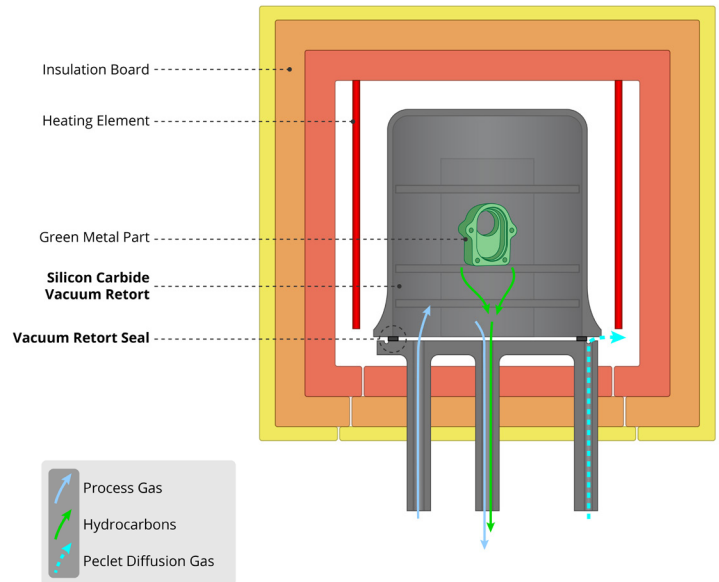
## TRADITIONAL VACUUM FURNACE DESIGN

Most industrial furnaces develop contamination over time as carbon and other contaminants build up inside the processing environment.



## NEW PURESINTER FURNACE DESIGN

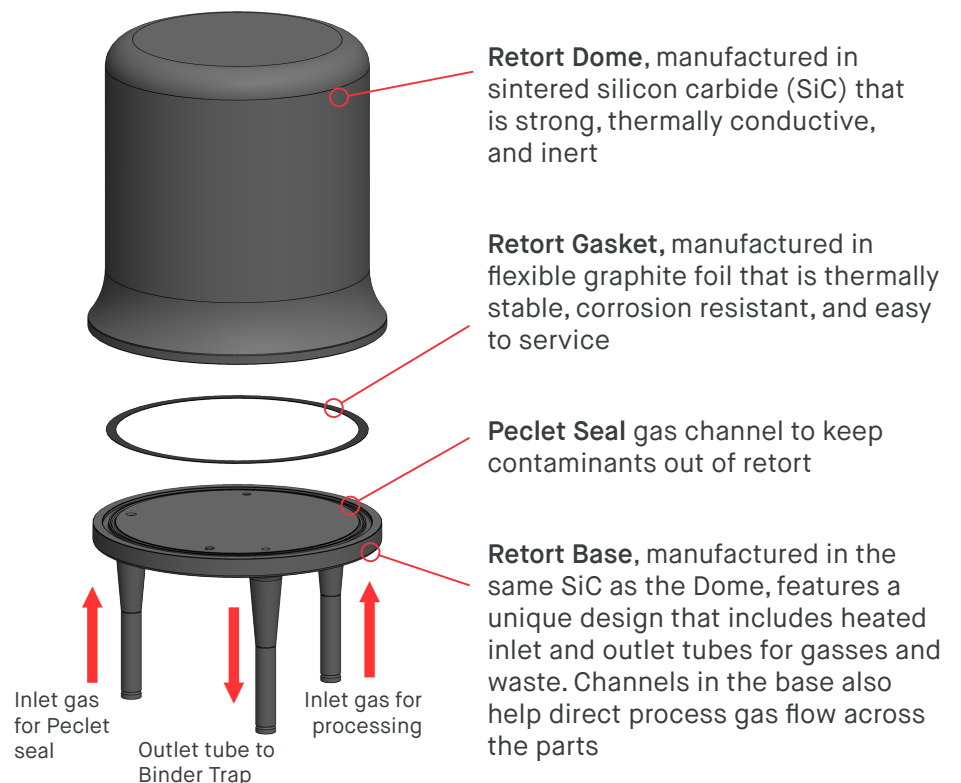
PureSinter utilizes a revolutionary Vacuum Retort that keeps the heating elements and insulation on the outside and the working volume airtight and clean.



## HIGH-PURITY VACUUM RETORT OVERVIEW

### Fundamental Operating Principles

- Entire Vacuum Retort and tubes are heated during debinding and sintering
- Binder is unable to condense inside retort or tubes
- Process gasses sweep contaminants out of Vacuum Retort through the heated outlet tube
- During sintering, an axial Peclet seal prevents contaminants from diffusing back into the retort





# PURESINTER WORKFLOW

## A clean and modern experience

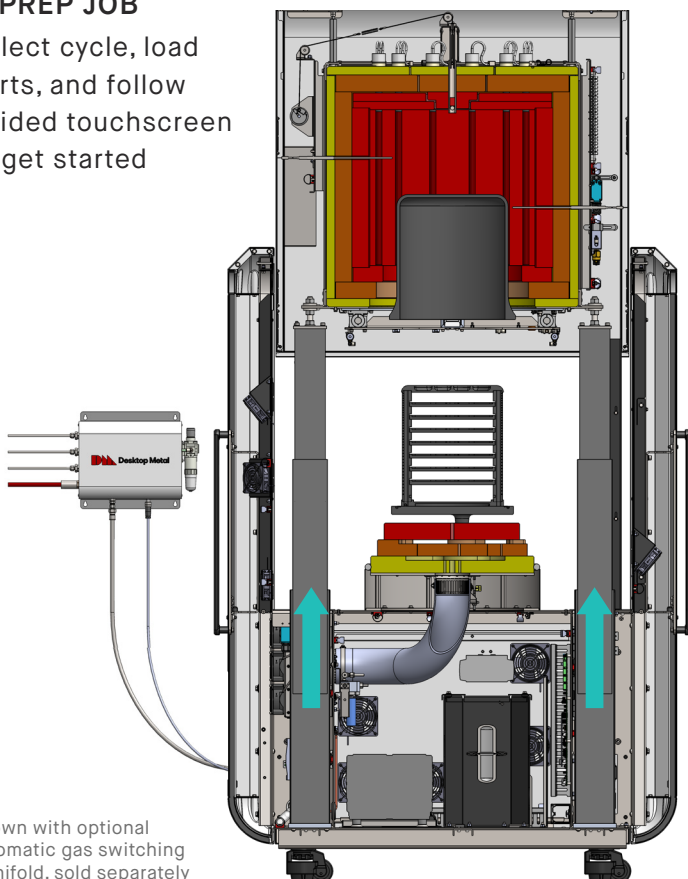
Inside its small footprint, the PureSinter furnace packs 15.8 liters of useable workload volume within a highly pure silicon carbide hot zone. At the touch of a button, the insulated thermal hood raises to expose fully-accessible and fully-adjustable retort shelving supporting up to 10 kilograms. With built-in debind and sinter profiles for Desktop Metal's most popular materials, starting a furnace run is simple and straightforward. Utilizing rapid air cooling, most furnace runs complete in less than 24 hours — and with our optional LiveMonitor cloud notifications, PureSinter will push alerts when ready to unload.

Using a custom debind and sinter profile? No problem — our Sinter Cycle Generator tool offers maximum flexibility for ramps, holds, and cooldown.



### 1. PREP JOB

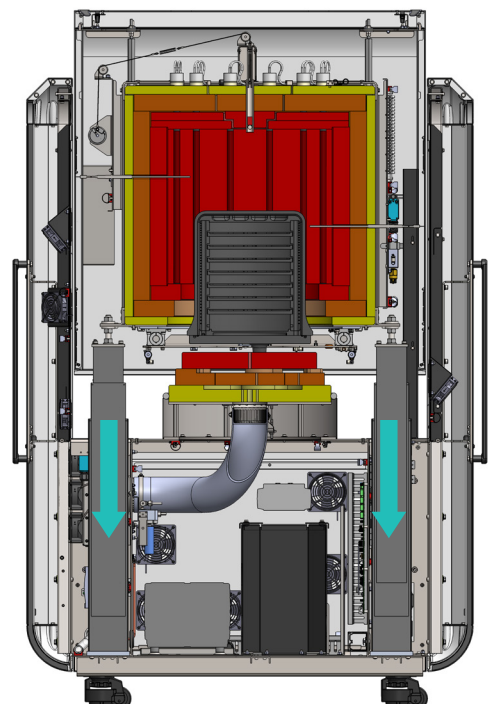
Select cycle, load parts, and follow guided touchscreen to get started



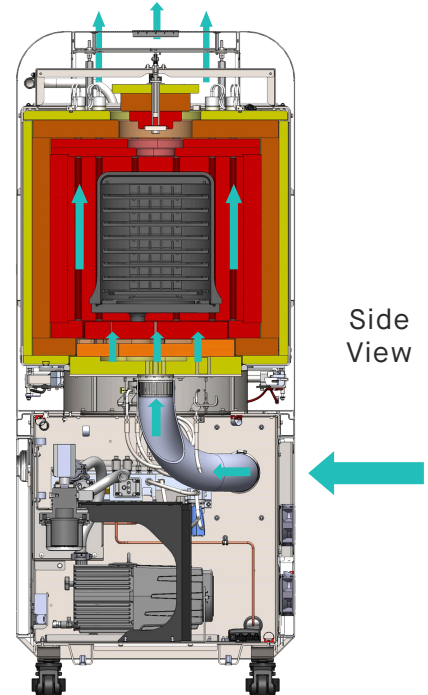
Shown with optional automatic gas switching manifold, sold separately

### 2. CLOSE THERMAL HOOD

Using safe, two-hand controls, the Vacuum Retort seals automatically as the dome is lowered onto the base





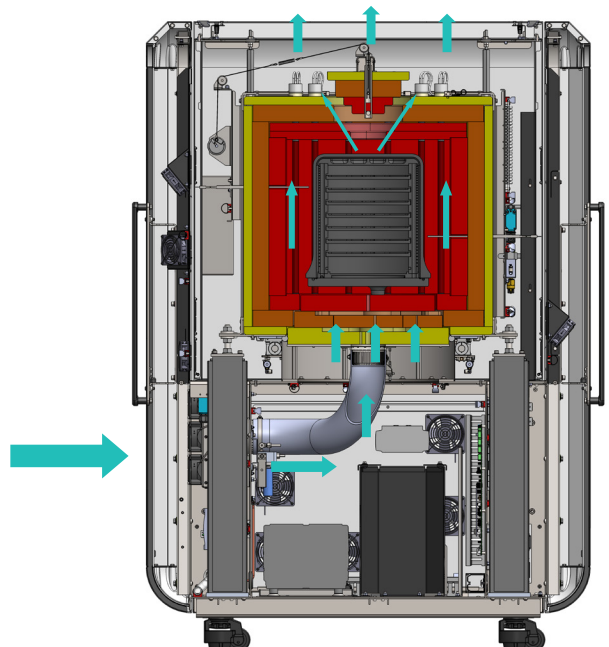
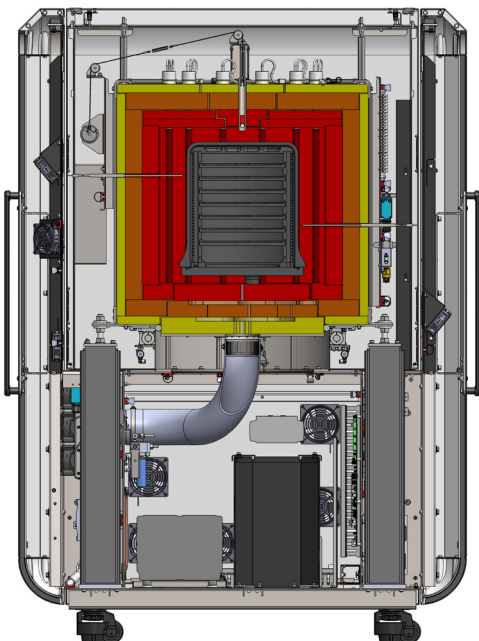


### 3. START THE PROCESS

With a press of the touch screen, debinding and sintering begins and the furnace exterior stays safe to touch.

### 4. RAPID COOL DOWN

Cool down rapidly and evenly, up to a max rate of 20°C per minute. Energy-efficient fans direct air through cooling ducts and a pop-out ceiling vent. When the temperature is safe, the hood raises completely so parts can be easily unloaded



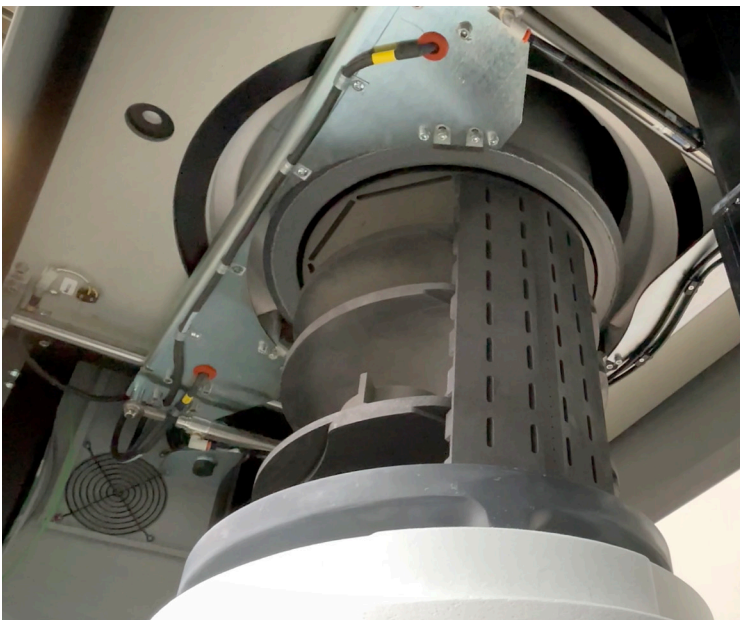


# USER-FRIENDLY CONCEPT

## Developed with safety and maintenance in mind

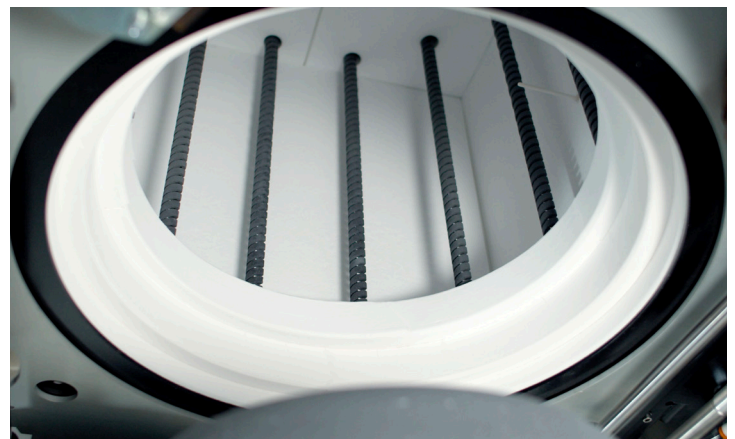
The PureSinter furnace was designed for ease-of-use to make sintering successful for a variety of users and applications. Traditional industrial furnaces are expensive to acquire, operate, and maintain with a lack of efficiency that contributes to high throughput times and operational costs.

The innovative design of PureSinter delivers a clean, more predictable processing environment. We eliminated dozens of the joint and valve leak points of traditional furnaces and leak tested our high-purity seal. The high-efficiency design of PureSinter lowers operating costs and dramatically lowers energy usage.



Utilizing rapid air cooling instead of the traditional water-cooled walls and recirculating blowers reduces facility requirements — while other industrial furnaces require more than 30 gallons-per-minute (GPM) of water, with PureSinter no incoming water line is required, nor is there any need for closed-loop spot coolers or chillers.

Any industrial furnace owner knows the rigorous maintenance schedule required for operation. From requiring frequent burnouts to an entire week of downtime for disassembly for annual cleaning, maintenance of traditional furnaces can be cumbersome and expensive. Our unique design makes cleaning fast and easy by eliminating hot zone contaminants in the sintering process. The onboard touchscreen guides users through maintenance tasks and a web interface let users program their own sinter cycles, view the furnace status, and explore sinter cycle history.



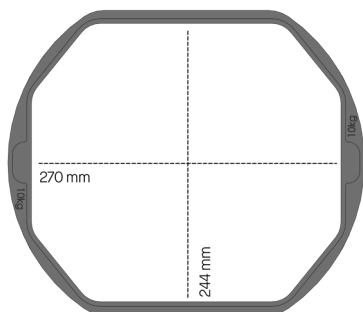
# GRAPHITE SHELVING

## Highly-pure, easily accessible

The “click into place” horizontal shelving system of PureSinter is made of high-purity graphite. With access from front and back, the shelving ensures optimum ergonomics.

RETORT VOLUME: 15.8 L

MAX SHELF DIMENSIONS:  
244 x 270 mm | 559 cm<sup>2</sup>



NUMBER OF SHELVES: Seven (7)  
Each labeled with load rating

- Six shelves, rated at 5 kg max
- One shelf, rated at 10 kg max

USABLE SHELF HEIGHT  
with 1.6 mm setter plate:

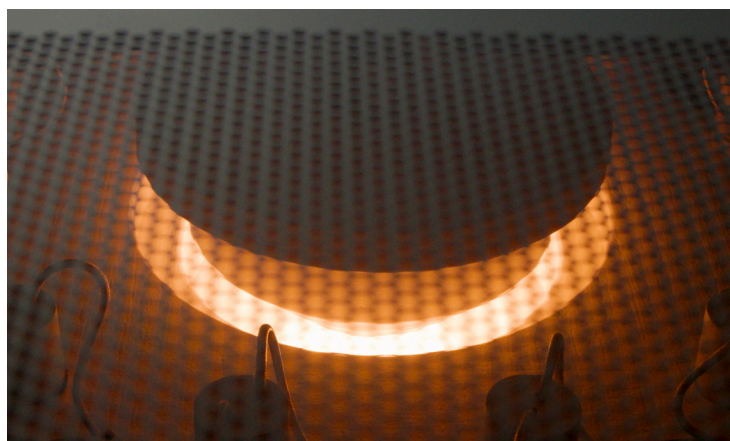
- 29.4 mm shelf to shelf
- Bottom shelf only: 295 mm

\* Additional clearance for tolerances  
and thermal expansion of parts may be  
desirable or required



# EFFICIENT COOLING

## Enhance turnaround times without water or chillers



Active, rapid cooling of PureSinter is enabled in a closed-loop controlled cooling process utilizing energy-efficient fans and a pop-out vent in the insulation pack roof. The air flow paths have been optimized to maximize cooling rates and minimize thermal gradients.

Because we're cooling outside of the Vacuum Retort, the high-flow cooling gas is simply air and does not interact with the sintering run or the parts themselves. This also means that PureSinter does not require high inert gas flow and/or a recirculating blower that is required with many traditional furnaces.



# PRE-SET OR CUSTOM

Ready to run additive and traditional parts with bespoke options

PureSinter is compatible with parts 3D printed with Bound Metal Deposition (BMD) or binder jet additive manufacturing (BJT) processes, as well as traditional Metal Injection Molding (MIM) or Press and Sinter (PM) manufacturing methods.

The furnace comes pre-loaded with our most popular Desktop Metal materials, and will be added regularly via over-the-air updates. For new or custom profile creation, use the optional Sinter Cycle Generator with an easy-to-use interface for ramp rate, hold time, temperature, and cooling parameters.



# DESKTOP METAL 3D PRINTERS

Programmed for easy use with our additive manufacturing line-up

Top, left to right:  
Studio System™,  
Shop System™,  
Production System™ P-1



Below, X-Series™:  
InnoventX, X25Pro,  
X160Pro



# VALIDATED MATERIALS

## Tested and validated on PureSinter

PureSinter delivers a breakthrough for sintered powder metal applications with the ability to process a variety of metals and binders. This material flexibility makes the furnace a fit for a variety of industries.

We've validated a variety of alloys, including

- Stainless steels
- Nickel-based alloys
- Tool steels
- Titanium\*

And we've tested PureSinter with a variety of binders

- CleanFuse
- SS01
- AquaFuse
- SPJ04
- FluidFuse
- MIM secondary binder\*

### See what's validated!

See the latest list of validated materials on the PureSinter furnace

[TeamDM.com/FurnaceMaterials](https://TeamDM.com/FurnaceMaterials)



Further validation of printable materials is continually ongoing. Speak to a sales representative about your material and our demand-based fast-tracking initiative.

\* Pre-mixed powder feedstocks (Studio System™ v1 and/or Metal Injection Molded) may require additional chemical debinding

# LIVE SINTER™ SOFTWARE

## Powerful, multi-physics sintering simulation

Live Sinter is manufacturing preparation software for the successful production of powder metal sintered parts.

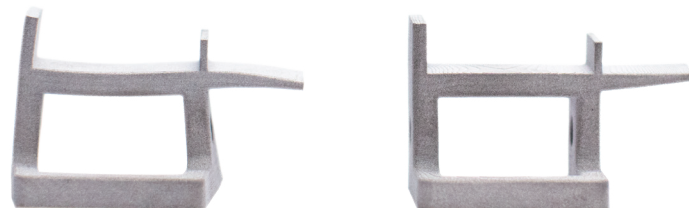
The powerful, multi-physics application provides advanced simulation tools to predict and correct for errors when sintering to deliver final components with tight tolerances, whether pressed, molded, or 3D printed. Live Sinter enables unique distortion compensation to help manufacturers not only reduce costs, but enable sintering to be successfully applied to a wider range of applications.

After scan-based adjustments, Live Sinter enables correcting for complex distortion effects, yielding parts that consistently fall within 1% of target dimension with as low as +/- 0.3% deviation, avoiding distortion, warping, and other common sintering challenges.

### Interested in a free trial?

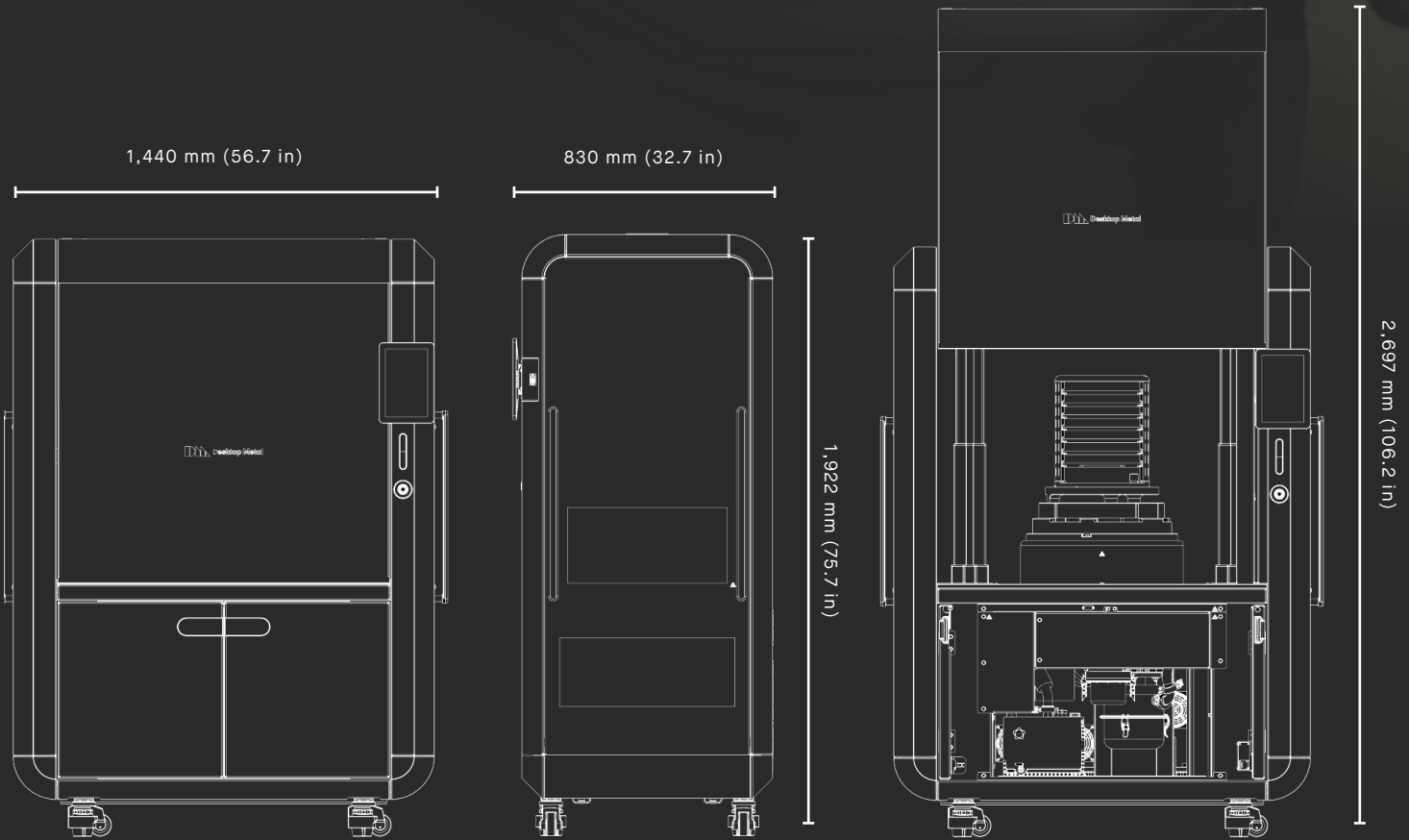
Reach out to our sales team to sign up for a trial of our software

[TeamDM.com/PureSinterTrial](https://TeamDM.com/PureSinterTrial)





# TECHNICAL SPECIFICATIONS



Workload envelope	244 x 270 x 265 mm (9.6 x 10.63 x 10.43 in)
Retort volume	15.8 L (0.56 ft <sup>3</sup> )
Atmosphere	Partial-pressure sintering (5-500 Torr)
Heating	(12) Standard resistive heating elements surrounding a silicon carbide retort
Max temperature	1,420°C (2,588°F)
Average heat load	16,700 BTU/hr for 2 hours
Max heat load	83,300 BTU/hr for 2 hours
Thermal uniformity	±5°C at sintering temperatures
Onboard controls	25.4 cm (10 in) touchscreen display
Gas types	Argon, nitrogen, forming gas, or Clean Dry Air (binder, material, and temperature dependent)
External dimensions (L x W x H)	1,440 x 830 x 1,922 mm (56.7 x 32.7 x 75.7 in)
Height in open position	2,697 mm (106.2 in)
Weight	680 kg (1,496 lbs)
Electrical requirements	200-220 V, 40A, 3ph, 50/60Hz or 380-415V, 20A, 3ph, 50/60Hz

*“Rather than trying to simply mitigate the factors which lead to poor performance in an all-in-one debinding and sintering furnace, we have eliminated them.”*

James Faso  
R&D Hardware Engineer  
Desktop Metal

# ADDITIONAL RESOURCES

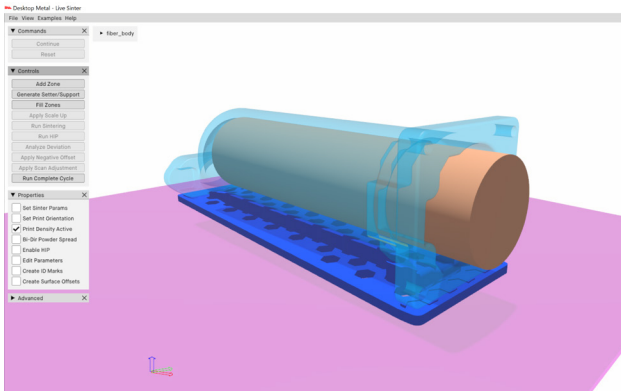


VIDEO

## PureSinter Video

At desktop metal, we don't innovate for innovation's sake. When it comes to furnaces, a cleaner furnace is a simpler, more reliable furnace. We've learned this by being furnace users ourselves. Hear from our CTO and the engineers who developed the revolutionary PureSinter furnace.

[TeamDM.com/PureSinterVideo](https://TeamDM.com/PureSinterVideo)



WEBINAR

## Learn More About Sintering Analysis and Compensation Software

Desktop Metal's Live Sinter™ is a manufacturing preparation software for the successful production of powder metal sintered parts. Advanced simulation predicts and corrects for errors when sintering 3D printed parts. Learn more about how it works in this on-demand webinar.

[TeamDM.com/LiveSinterWebinar](https://TeamDM.com/LiveSinterWebinar)

Learn more about binder jetting and find more customer success stories at

[TeamDM.com/PureSinter](https://TeamDM.com/PureSinter)

# Additive Manufacturing 2.0

Metal | Polymer | Ceramic | Composite | Wood

Printer platforms



Desktop Health™



Materials



Applications and more



Desktop Labs

## DESKTOPMETAL.COM

Desktop Metal (NYSE:DM) is driving Additive Manufacturing 2.0, a new era of on-demand, digital mass production of industrial, medical, and consumer products. Our innovative 3D printers, materials, and software deliver the speed, cost, and part quality required for this transformation. We're the original inventors and world leaders of the 3D printing methods we believe will empower this shift, binder jetting and digital light processing. Today, our systems print metal, polymer, sand and other ceramics, as well as foam and recycled wood. Manufacturers use our technology worldwide to save time and money, reduce waste, increase flexibility, and produce designs that solve the world's toughest problems and enable once-impossible innovations. Learn more about Desktop Metal and our #TeamDM brands at DesktopMetal.com