

# Additive Manufacturing for Tooling

Unlock the next level of performance for your tooling inserts  
with large format printing and enhanced conformal cooling

---

## Table of Contents:

Manufacture the Parts You Need - Without Compromise	03
Experience Unprecedented Design Freedom with Velo3D	04
Build Bigger and at Volume with Velo3D	05
Assure Production Quality with Velo3D	06
Breaking the Mold: Velo3D's Next-Generation Metal AM Solution	07
Pioneering the Future of Tooling	08

# Manufacture the Parts You Need - Without Compromise

Today's advanced tooling manufacturers want to design and iterate faster, speed up production times, assure yield quality, and improve the durability and performance of their inserts.

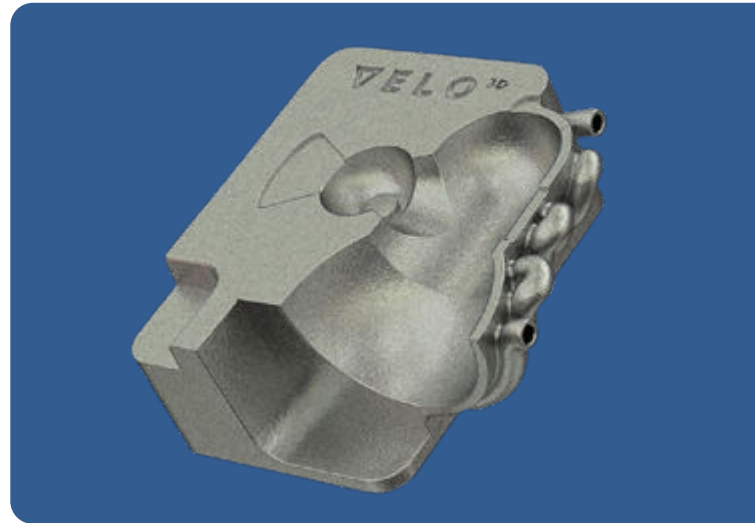
Achieving all this, and more, is mission critical to the needs of customers in the aerospace, energy, automotive, and other industries for whom the rapid and repeatable production of high-quality cast parts is essential.

Until now the limitations of conventional 3D metal printers made it difficult for tooling manufacturers to harness the full potential of additive manufacturing (AM) and advanced tooling manufacturing processes. But no more.

Velo3D's fully integrated metal AM solution delivers best-in-class pre-print design software, state-of-the-art large format printers, and quality assurance software on one unified platform.

Delivering unparalleled design freedom and advancements in automated calibration routines, parts can now be printed to exacting standards of consistency, quality, and repeatability. Simply put, Velo3D is taking metal AM to new levels of performance and efficiency.

Velo3D's solution addresses several key challenges that have prevented tooling manufacturers from unleashing metal AM and transforming their tooling operations.



## Go further, faster, with Velo3D

Our technology enables engineers to bypass the limitations of traditional manufacturing rules to produce the parts they need without compromise.

With Velo3D, firms can now print bigger, print better, print faster. Taking advantage of newfound capabilities to:

- Innovate with confidence, handling complex geometries with ease
- Produce new and radical designs fast
- Verify quality in real-time and at every build layer
- Produce high performance differentiated parts
- Build stronger, more durable products
- Engage in distributed manufacturing, conducting development in-house while enabling their CM supply network to produce inserts on-demand anywhere in the world



# Experience Unprecedented Design Freedom with Velo3D

Conventional additive manufacturing methods have made it difficult to create the customized cooling channels needed for effective and uniform cooling - resulting in longer production time. Conformal cooling, however, opens up exciting new opportunities.

In die cast production, cooling of the die cast insert constitutes around 70% of the cycle time to manufacture a part. By accelerating the cooling rate through conformal cooling, tooling designers can not only speed up production times, they can increase the lifetime of the cooling inserts and even improve the material properties of the end use part.

With Velo3D, tooling manufacturers can take advantage of these next generation capabilities; printing inserts with complex conformal cooling channels that follow the contours of a part to provide more optimized cooling.

Achieve the Next Generation of Tooling Inserts:



Reduce cycle times and accelerate manufacturing



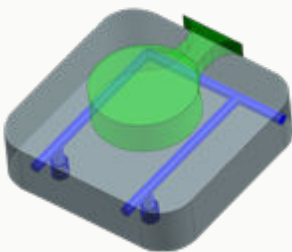
Eliminate hot spots and thermally balance tools to create casts that solidify near-simultaneously




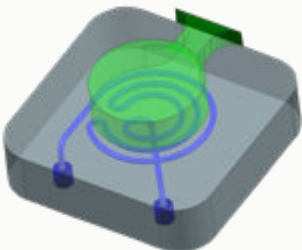
Reduce design deviations and improve the material properties and durability of parts




Produce high performance inserts and molds with consistent material properties and geometric accuracy



 Conventional cooling example  
The simple design demonstrates a single loop for coolant. Image courtesy of Ante Lausic, Lead Process Engineer – Metal AM, GM.



 Conformal cooling example  
This more sophisticated design matches the surface area to cool faster. Image courtesy of Ante Lausic, Lead Process Engineer – Metal AM, GM.

# Build Bigger and at Volume with Velo3D

Limited printer size has historically been a roadblock for tooling firms that want to cast produce larger inserts with the benefit of conformal cooling channels.

Designed with innovation in mind, Velo3D's advanced large capacity 3D printers and integrated print design and quality assurance software makes it easier to unlock the true potential of metal AM. For example, with the Sapphire XC, engineers now have access to large format printing for their inserts together with the ability to create larger cooling channels that optimize the flow of coolant and eliminate the risk of cracking.

Capable of printing channels up to 100 mm in diameter with a quality surface finish, Velo3D's fully integrated metal AM solution unlocks the true potential of advanced metal AM.

Making it possible to:

600

Manufacture larger molds and inserts up to 600 mm using the power of 8 one kilowatt lasers synchronized with seamless overlay and in-situ alignment

100

Increase cooling channel size with a higher quality surface finish to eliminate the risk of premature failures

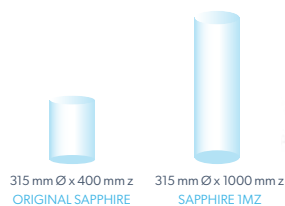


Map conformal cooling channels to hot surfaces for quicker cooling

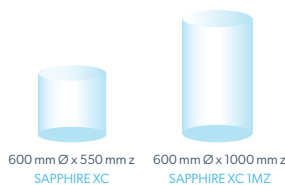


Increase coolant flow volume to optimize performance on larger inserts

## Sapphire



## Sapphire XC

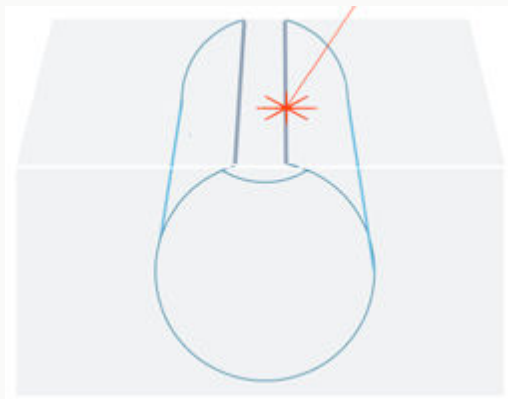


The Sapphire family of metal AM printers.

# Assure Production Quality with Velo3D

Velo3D's integrated solution enables tooling manufacturers to print parts with a high-quality surface finish that reduces the risk of cracking and unlocks new design potential.

Our capabilities include the ability to increase the size of cooling channels and print truly circular channel cross-sections - even at large diameters. This allows engineers to avoid printing performance-compromising teardrop-shaped channels common among conventional AM machines.



Horizontal circular channels, when printed layer-by-layer, feature two sides that must weld together resulting in high risks for potential deformation.

With Velo3D, engineers can take advantage of:



Automated calibration routines and runtime laser alignment checks that deliver a virtually invisible overlay or stitch zone with no deformation



Large format printers with 8 lasers that print high quality mold inserts at a higher throughput and with zero drift



A suite of sensors tracking nearly 1,000 different signals during a print providing real-time layer-by-layer tracking of critical features



Complex geometry printing capabilities, including low angle prints down to zero degrees and high aspect ratio structures

# Pioneering the Future of Tooling

Velo3D's integrated solution opens the door to larger capacity printing and delivers the cooling channel design freedom manufacturers need to ensure their die cast inserts achieve improved durability, longevity, and efficiency.

With Velo3D manufacturers can unlock the full potential of metal AM for tooling and:

- Accelerate and control temperature declines in tooling inserts (time per shot goes down)
- Increase the format size and lifetime of inserts
- Initiate a robust printing process that yields a higher surface finish with consistent mechanical properties
- Print high quality mold inserts at a higher throughput with 8 synchronized lasers capable of 1kW of power each



Capable of printing a variety of metals, including M300 steel, engineers can choose from a wealth of options and configurations to achieve their production goals.

## Beyond Technology: Support Customers Can Rely On

Our mission is to assist customers in overcoming complex engineering problems. Our seasoned support professionals are always ready to lend a hand. From imparting knowledge on how to successfully leverage AM for transforming parts manufacturing, tackling on-the-spot technical issues, to pioneering the next generation super alloy for unrivaled innovation, we are your partner in your AM journey.





# Breaking the Mold: Velo3D's Next-Generation Metal AM Solution

Our solution unites software, hardware, and an intelligent underlying manufacturing process to achieve higher quality, scalability, and unmatched repeatability.



## Flow Print Preparation

With Velo3D, engineers can dramatically reduce time from initial concept to one build file for use on any Velo3D printer anywhere. Assigning geometry-specific scanning instructions to produce a robust printing process that yields a higher quality surface finish and consistent material properties without compromising on design.



## State-of-the-art Metal 3D Printers

Our Sapphire family of printers are designed for use with a broad range of alloys, and controlled layer by layer for predictable and efficient production. Featuring a proprietary non-contact re-coater that reduces the risk of part collisions and dramatically improves yields, tooling manufacturers are able to build previously impossible parts without compromise.



## Assure Quality Validation

Providing instant visibility into every layer of the build through real-time sensors, physics-based excursion detection algorithms, and optical measurements, our Assure software and in-situ monitoring systems ensure parts are built layer by layer with no defects.



To discover more, why not get in touch with our expert engineering team today and find out how advanced additive manufacturing could transform the future of your operations.

Without Compromise

### Headquarters

2710 Lakeview Court  
Fremont, CA 94538

### Get in Touch:

[velo3d.com](https://velo3d.com)  
[info@velo3d.com](mailto:info@velo3d.com)