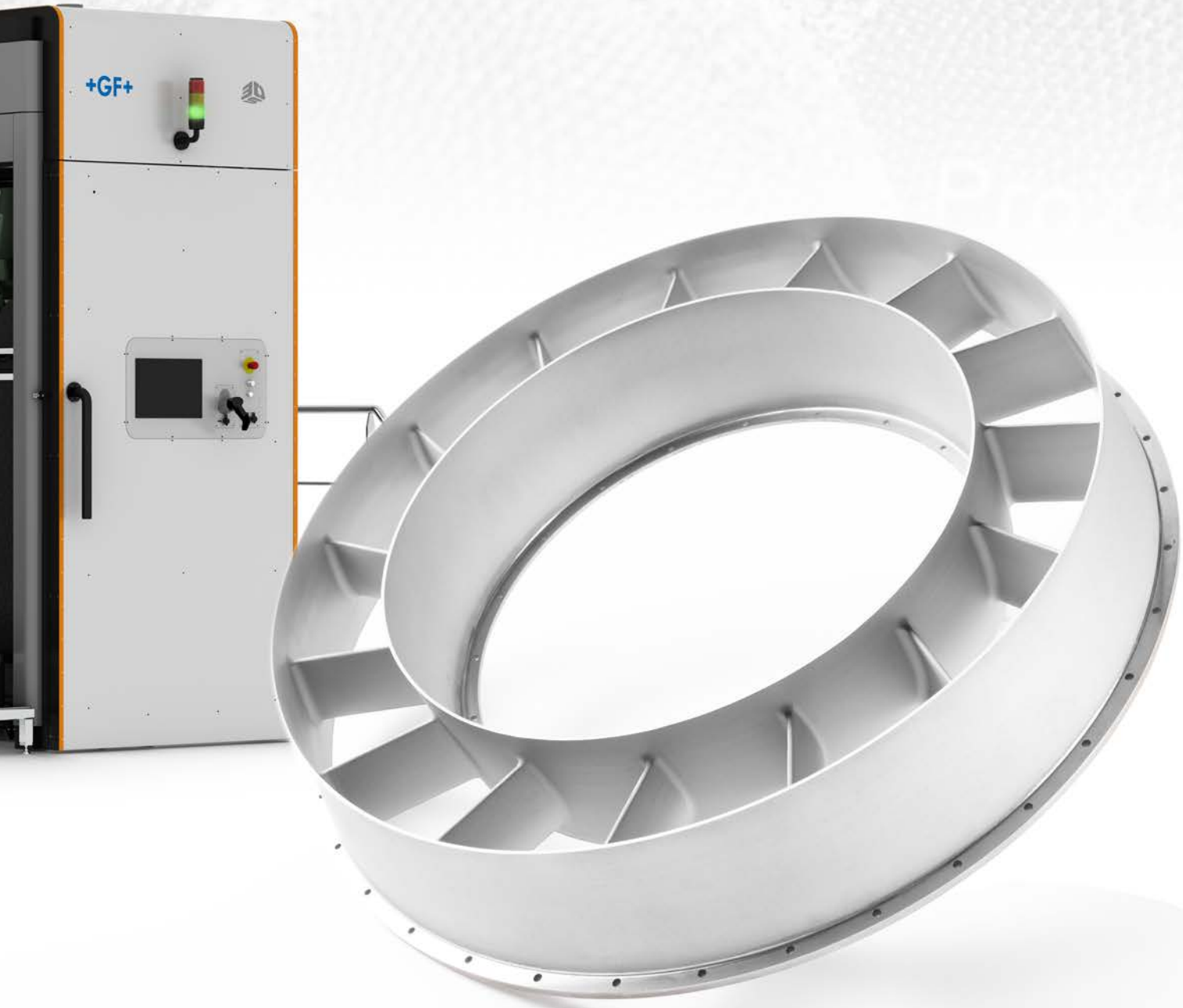
GF Machining Solutions

Comprehensive Additive Manufacturing Solutions

GF Machining Solutions: all about you

When all you need is everything, it's good to know that there is one company you can count on to deliver complete part-processing solutions, from world-class electrical discharge machines (EDM), Laser Texturing and Additive Manufacturing to first-class Milling and Spindles, Tooling, Automation and software systems. Our AgieCharmilles, Microlution, Mikron Mill, Liechti, Step-Tec and System 3R technologies – all backed by unrivalled customer service and support – help you raise your Additive Manufacturing game and increase your competitive edge.

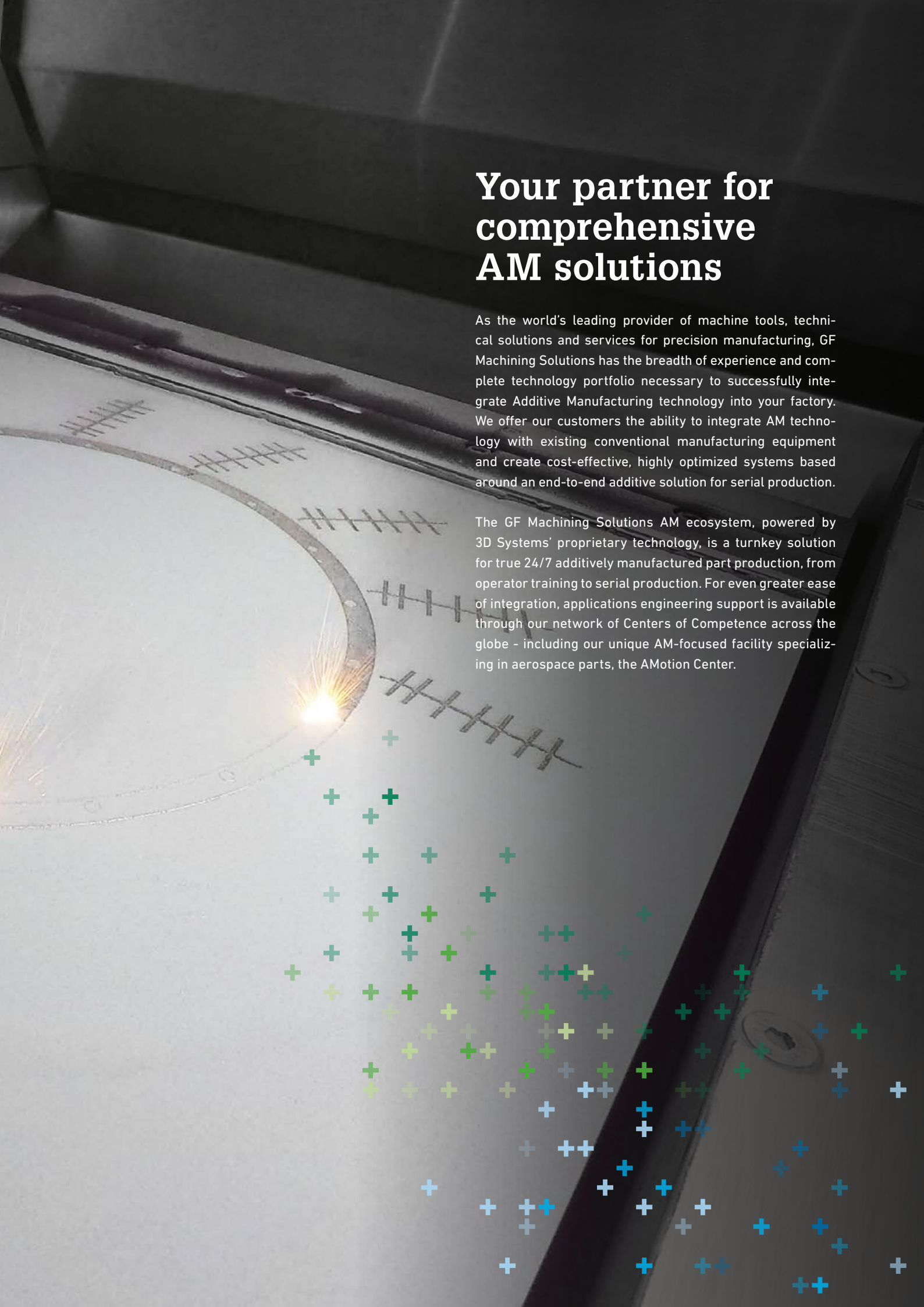
Contents



Reimagining the AM factory, redefining manufacturing success

From the production of improved robot end-of-arm grippers, molds and dies to advanced medical, dental and aerospace components, Additive Manufacturing (AM) is a transformative technology. When combined with software solutions that maximize the advantages of AM processes, manufacturers can redesign parts with dramatically lower weights, improved functionality and shorter lead times. For these reasons, metal AM revolutionizes entire industries – and the time to invest is now.

However, many manufacturers still believe metal AM technology is out of reach for their plants, as the initial or ongoing material costs and cost per part are thought to be too high. Others are concerned about their limited access to knowledge about AM technology. And while manufacturers recognize that AM represents the future of production, shops still need a partner that understands how to profitably integrate that futuristic technology into their existing workflow.



Your partner for comprehensive AM solutions

As the world's leading provider of machine tools, technical solutions and services for precision manufacturing, GF Machining Solutions has the breadth of experience and complete technology portfolio necessary to successfully integrate Additive Manufacturing technology into your factory. We offer our customers the ability to integrate AM technology with existing conventional manufacturing equipment and create cost-effective, highly optimized systems based around an end-to-end additive solution for serial production.

The GF Machining Solutions AM ecosystem, powered by 3D Systems' proprietary technology, is a turnkey solution for true 24/7 additively manufactured part production, from operator training to serial production. For even greater ease of integration, applications engineering support is available through our network of Centers of Competence across the globe - including our unique AM-focused facility specializing in aerospace parts, the AMotion Center.

Transformative solutions for every industry

Metal 3D printing has already had an impact on part-production operations across numerous industries, particularly the aerospace and medical sectors. Initially, metal AM technology was used for rapid prototyping and the production of small, intricate parts with precise internal features. Now, whether it's software that provides the complete process traceability required by aerospace manufacturers or machine capabilities that can handle the geometric complexity of modern medical parts, today's AM solutions enable a far greater range of applications, helping all industries benefit from the unique part-production advantages of metal AM processes.

Function optimization

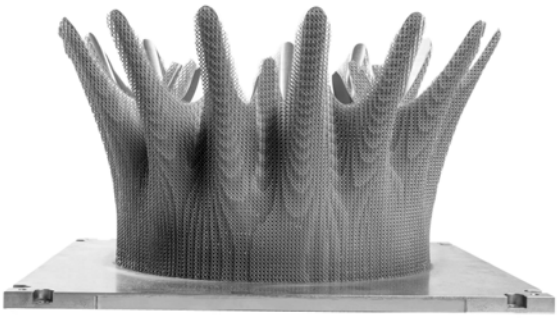
Open, porous lattice structures made possible by AM allow these titanium spinal implants to accelerate the rate of bone healing and fusion.

Weight reduction

Topological optimization makes these aerospace brackets significantly lighter, while the efficient AM workflow offers a more cost-effective process.

Process optimization

The combination of additive technology with conventional subtractive machining provides significant cost savings and improved performance for these cutting tools.



Rapid prototyping

The power of metal AM allows engineers to iterate and test new designs quickly – even large parts like this lobed exhaust mixer.

Lead time reduction

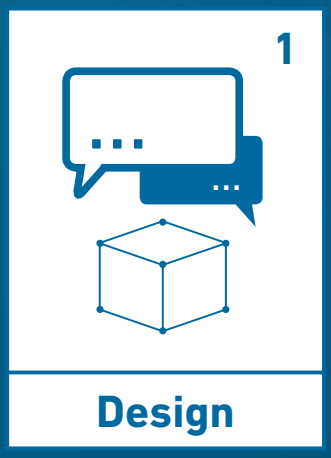
With metal AM, this Formula 1 exhaust is lighter, simpler and more effective – and eliminating the assembly process means it can be completed in one step instead of 20.

Improved mold performance

Optimized internal cooling channels reduce the operating temperature of this die casting insert by half while also shortening cycle times and increasing the lifespan of its coating.

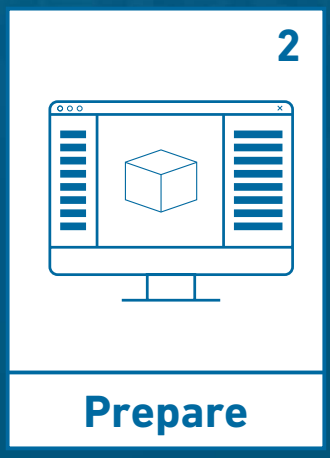
Simplify AM technology integration

GF Machining Solutions offers a full, comprehensive range of Additive Manufacturing solutions. With a thorough understanding of every part of the additive workflow, we are experts in seamlessly integrating metal AM technology into existing conventional manufacturing facilities. Our solutions cover the entire part-production cycle to deliver greater productivity and ease of use.



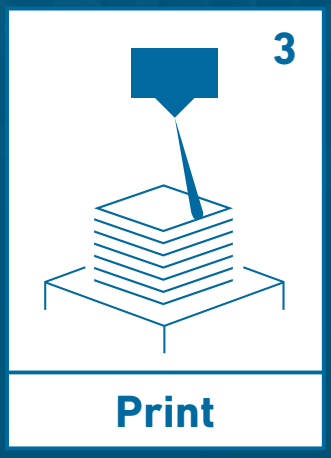
Design

At Centers of Competence around the world and the AMotion Center in Stabio, Switzerland, our additive experts are available to help with your toughest application challenges.



Prepare

With 3DXpert®, an all-in-one software solution for serial AM production, users can design and import parts in virtually any CAD or mesh file.



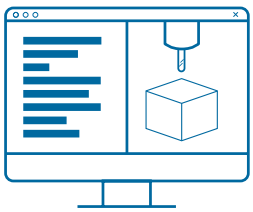
Print

Direct Metal Printing (DMP) systems are designed for serial production of high-quality parts. System 3R Tooling for AM offers better flexibility and improved productivity for post-processing operations.

Inspect

DMP Monitoring allows operators to see, analyze, understand and refine their metal AM processes and perform post-build process analysis for better parameter optimization and quality control.

5



NC prep

3DXpert® provides users with a complete suite of post-processing operations optimized for metal AM to prepare the workpiece for subtractive machining.

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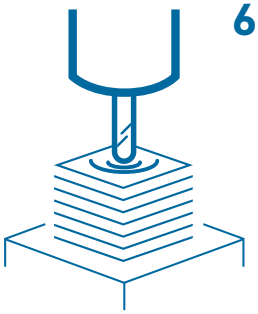
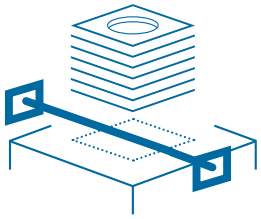


Milling

Using programs produced through 3DXpert®, GF Machining Solutions milling technology may be used for a wide range of finishing operations for 3D-printed parts.

7



Separate

For the greatest efficiency and process security, additively manufactured parts can be separated from the build plate with the new CUT AM 500, an innovative horizontal wire EDM.

8

Final part

Following workpiece separation, the additively manufactured part is ready for any final polishing or post-machining processes prior to customer delivery.

High throughput and high repeatability for the highest AM quality

The Direct Metal Printing (DMP) series of machines delivers innovative metal 3D-printing solutions designed for easy scalability and the lowest total cost of ownership. Powerful 3DXpert® software, LaserForm® materials, unique vacuum chamber build environments and smart powder management solutions complete the package and provide a state-of-the-art platform as well as exceptional ease of use.

Available Materials

+ Aluminum alloys
- LaserForm AlSi7Mg0.6
- LaserForm AlSi10Mg
- Certified Al6061-RAM2
- Certified Scalmalloy
- Certified Aheadd CP1

+ Titanium alloys
- LaserForm Ti Gr1
- LaserForm Ti Gr5
- LaserForm Ti Gr23

+ Steels
- LaserForm 316L
- LaserForm 17-4PH
- LaserForm Maraging Steel
- Certified Böhler M789

Cobalt-chrome alloys
+ LaserForm CoCrF75

+ Nickel alloys
- LaserForm Ni718
- LaserForm Ni625
- Certified HX
- Certified GRX-810

+ Refractory metals
- Certified Tungsten
- Certified C-103

+ Copper alloys
- Certified CuCr1Zr
- Certified CuCr2.4
- Certified CuNi30
- Certified GRCop-42
- Certified Pure Cu

DMP Flex 350 (Single / Dual / Triple)

DMP Factory 350 (Single / Dual)

DMP Factory 500

CUT AM 500

DMP Flex/Factory 350 (Single / Dual / Triple)

The DMP Flex 350 enables more efficient production of very dense and pure 3D printed metal parts with improved gas flow technology for higher throughput and greater, more uniform part quality across the entire build area. This flexible metal AM solution generates high-quality precision parts from even the most challenging alloys with a maximum part size of 275 x 275 x 420 mm or 350 x 350 x 350 mm. The DMP Factory 350 builds on the DMP Flex 350's platform with an integrated powder management solution for a safe and efficient way to improve powder integrity.

	Laser power type	Build volume (X x Y x Z)	Layer thickness	Repeatability	Typical Accuracy
DMP Flex 350 (Single / Dual / Triple)	1 or 2 or 3 x 500 W Fiber laser[1]	275 x 275 x 420 mm (10.82 x 10.82 x 16.54 in)[2] 350 x 350 x 350 mm (13.78 x 13.78 x 13.78 in)	5-100 µm (preset: 30, 60, 90 µm)	x=60 µm y=60 µm z=60 µm	±0.1-0.2% with ±100 µm minimum
DMP Factory 350 (Single / Dual)	1 or 2 x 500 W Fiber laser[1]	275 x 275 x 420 mm (10.82 x 10.82 x 16.54 in)[2]	5-100 µm (preset: 30, 60, 90 µm)	x=60 µm y=60 µm z=60 µm	±0.1-0.2% with ±100 µm minimum

[1]Maximum laser power at powder layer is typically 450W for 500W lasers.

[2]Height inclusive of build plate.

DMP Factory 500

A workflow-optimized 3D metal printing solution, the DMP Factory 500 delivers exceptional scalability and repeatability for the lowest total cost of ownership. Large parts up to 500 x 500 x 500 mm in size can be produced with outstanding repeatability at the highest levels of throughput. Engineered using 3D Systems' proven precision additive technology, GF Machining Solutions' technical and industrial expertise, and System 3R's precision clamping systems, the DMP Factory 500 is a streamlined, fully integrated metal AM platform.

	Laser power type	Build volume (X x Y x Z)	Layer thickness	Repeatability	Typical Accuracy
DMP Factory 500	3 x 500 W/Fiber Laser[1]	500 x 500 x 500 mm (19.7 x 19.7 x 19.7 in)[2]	2-200 µm (preset: 30, 60, 90 µm)	x=75 µm y=75 µm z=75 µm	±0.1-0.2% with ±100 µm minimum

[1]Maximum laser power at powder layer is typically 450W for 500W lasers.

[2]Height inclusive of build plate.

An EDM innovation for fully secure metal AM production

The AgieCharmilles CUT AM 500 is a unique EDM post-processing system that offers a fast, precise, affordable and automation-ready alternative to standard EDM machines or band saws for separating additively manufactured parts from build plates. A tilting table, horizontal small-diameter molybdenum wire and customizable part-catching baskets ensure precise cut-offs and prevent damage to parts. The double-spool concept reduces operational costs to those equivalent of a band saw while at the same time providing extremely fast cutting as compared to conventionally configured EDM equipment.

Technical data	CUT AM 500
Max. part dimensions (base plate + parts)	510 x 510 x 510 mm (20.08 x 20.08 x 20.08 in)
Max. weight (base plate + parts)	500 kg (1,102.3 lb)
Wire diameter	0.2 mm (0.008 in)
Max. cutting speed	Up to 240 mm2/min
Accuracy	±0.1 mm (0.004 in)
Roughness (Ra)	<6 µm

AMotion Center

Complete AM expertise and support on demand

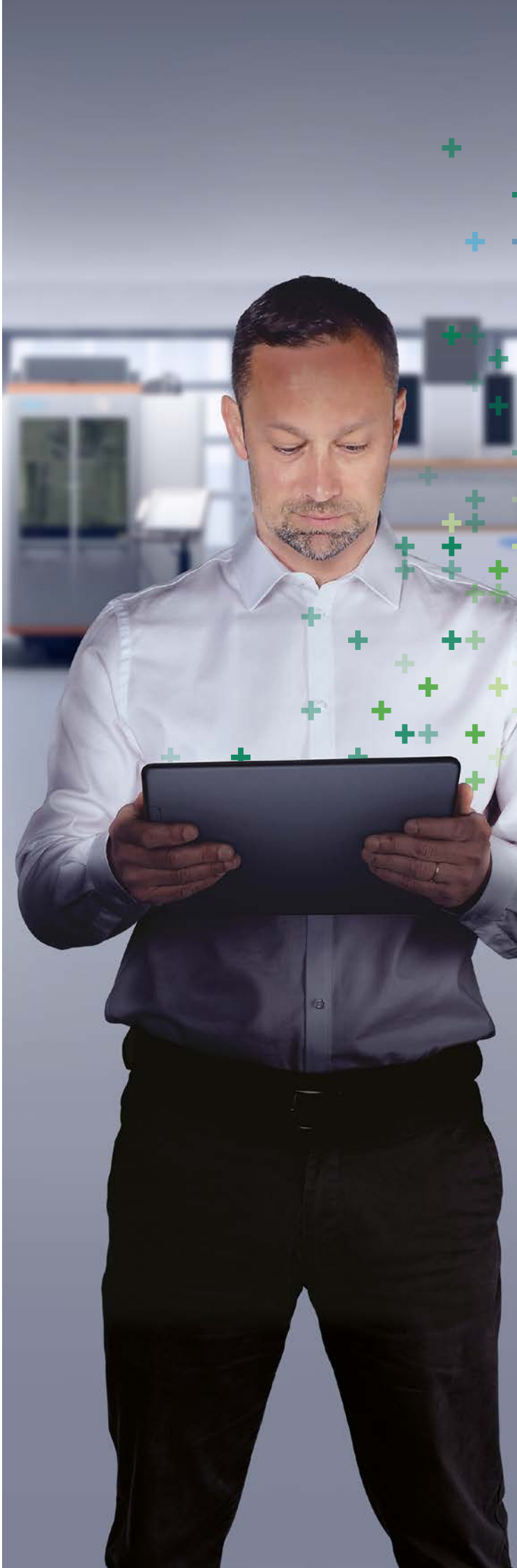
GF Machining Solutions offers more than a complete suite of metal AM machines and software – we offer full part-production lifecycle support to our customers through our AMotion Center (Stabio, Switzerland), one of the industry's most advanced competence centers for AM technology. From the initial planning stages, part design and prototypes to validation, production and post-processing, the AMotion Center is prepared to serve as your AM partner, particularly for aerospace applications. And as the first company worldwide to offer fully NADCAP-certified 3D printing processes and post-processes, the center has demonstrated its commitment to meeting the highest standards of quality.

Centers of Competence

Staffed by expert applications engineers, GF Machining Solutions' global network of Centers of Competence offer opportunities for training and product demonstrations on the latest manufacturing technology, including metal AM at many locations around the world. Contact your local GF Machining Solutions representative to learn more about how AM part production can help you build your business.

Locations with AM experts

+ Lincolnshire, Illinois, United States
+ Losone, Switzerland
+ Milano, Italy
+ Schorndorf, Germany
+ Warsaw, Poland
+ Tokyo, Japan
+ Shanghai, China
+ Singapore



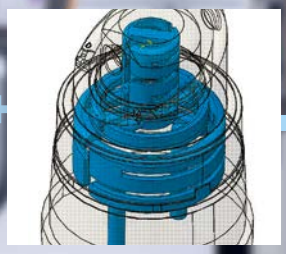
Six solutions, one partner

The team at the AMotion Center offers a complete production process value chain designed to help our partners reduce their development cycles, experiment with part geometries and materials, and ramp up production.

1

+ Consulting & training

Our broad experience with AM technology allows us to support you throughout the entire development and production process.



2

+ Design, engineering & development

We leverage our engineering know-how and understanding of AM-grade materials to help you develop highly complex metal components.

3

+ Rapid prototyping

Our production facility uses two AM technologies so that we can offer high-quality prototypes within days or even hours, depending on the scope of your project.

Accredited Nadcap™

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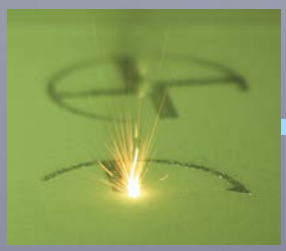
+ Part qualification

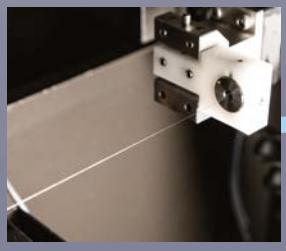
We hold the NADCAP certificate for Additive Manufacturing (AC7110/14) and the NADCAP Revision A standard, making us the perfect part qualification partner.



5

+ Serial production

Our production center in Stabio, Switzerland has the capacity and flexibility to support your serial part-production goals.



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+ Ready-to-mount solutions

In addition to 3D printing services, we offer complete and certified in-house post-processing through GF Precicast SA.

A complete portfolio of world-class manufacturing technologies

Our commitment to you and your specific applications is proven by the intelligence, productivity and quality delivered by our multi-technology solutions. Your success is our chief motivator. That's why we are continuously advancing our legendary technical expertise. Wherever you are, whatever your market segment and whatever the size of your operation, we have the complete solutions and the customer-centric commitment to accelerate your success—today.

EDM (Electrical Discharge Machining)

Wire-cutting EDM
GF Machining Solutions' wire-cutting EDM is fast, precise and increasingly energy efficient. From ultraprecise machining of miniaturized components down to 0.02 mm to powerful solutions for demanding high-speed machining with respect to surface accuracy, our wire EDM solutions position you for success.

Die-sinking EDM
GF Machining Solutions is revolutionizing die-sinking EDM with features like iGAP technology to dramatically boost machining speed and reduce electrode wear. All of our die-sinking systems offer fast removal and deliver mirror finishes of Ra 0.1 µm (4 µin).

Hole-drilling EDM
GF Machining Solutions' robust hole-drilling EDM solutions enable you to drill holes in electrically conductive materials at a very high speed—and, with a five-axis configuration, at any angle on a workpiece with an inclined surface.

Milling

Milling
Precision tool and mold manufacturers enjoy a competitive edge with our Mikron MILL S solutions' fast and precise machining. The Mikron MILL P machines achieve above-average productivity thanks to their high performance and Automation. Customers seeking fastest return on investment benefit from the affordable efficiency of our MILL E solutions.

High Performance Airfoil Machining
Our Liechti turnkey solutions enable the highly dynamic manufacturing of precision airfoils. Thanks to the unique performance and our expertise in airfoil machining, you increase productivity by producing at the lowest cost per part.

Spindles
As part of GF Machining Solutions, Step-Tec is engaged in the very first stage of each machining center development project. Compact design combined with excellent thermal and geometric repeatability ensure the perfect integration of this core component into the machine tool.

Advanced manufacturing

Laser texturing
Aesthetic and functional texturing is easy and infinitely repeatable with our digitized Laser technology. Even complex 3D geometries, including precision parts, are textured, engraved, microstructured, marked and labeled.

Laser micromachining
GF Machining Solutions offers the industry's most complete line of Laser micromachining platforms optimized for small, high-precision features to meet the increasing need for smaller, smarter parts to support today's leading-edge products.

Laser Additive Manufacturing (AM)
GF Machining Solutions and 3D Systems, a leading global provider of additive manufacturing solutions and the pioneer of 3D printing, have partnered to introduce new metal 3D printing solutions that enable manufacturers to produce complex metal parts more efficiently.

Tooling and Automation

Tooling
Our customers experience complete autonomy while maintaining extreme accuracy, thanks to our highly accurate System 3R reference systems for holding and positioning electrodes and work pieces. All types of machines can easily be linked, which reduces set-up times and enables a seamless transfer of workpieces between different operations.

Automation
Together with System 3R, we also provide scalable and cost-effective Automation solutions for simple, single machine cells or complex, multi-process cells, tailored to your needs.

Software

Digitalization solutions
To drive its digital transformation, GF Machining Solutions acquired symmedia GmbH, a company specialized in software for machine connectivity. Together, we offer a complete range of Industry 4.0 solutions across all industries. The future requires the agility to adapt quickly to continual digital processes. Our intelligent manufacturing offers embedded expertise, optimized production processes, and workshop Automation: solutions for smart and connected machines.

Customer Services

Worldwide for you
Ensuring the best performance throughout the lifetime of our customers' equipment is the goal of our three levels of support. Operations Support offers the complete range of original wear parts and certified consumables. Machine Support includes spare parts, technical support, and a range of preventive services to maximize machine uptime. Business Support offers customer-specific business solutions.

Fully connected to your needs, at home and across the globe

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GF Machining Solutions

Transform your manufacturing operations with our metal additive systems.

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