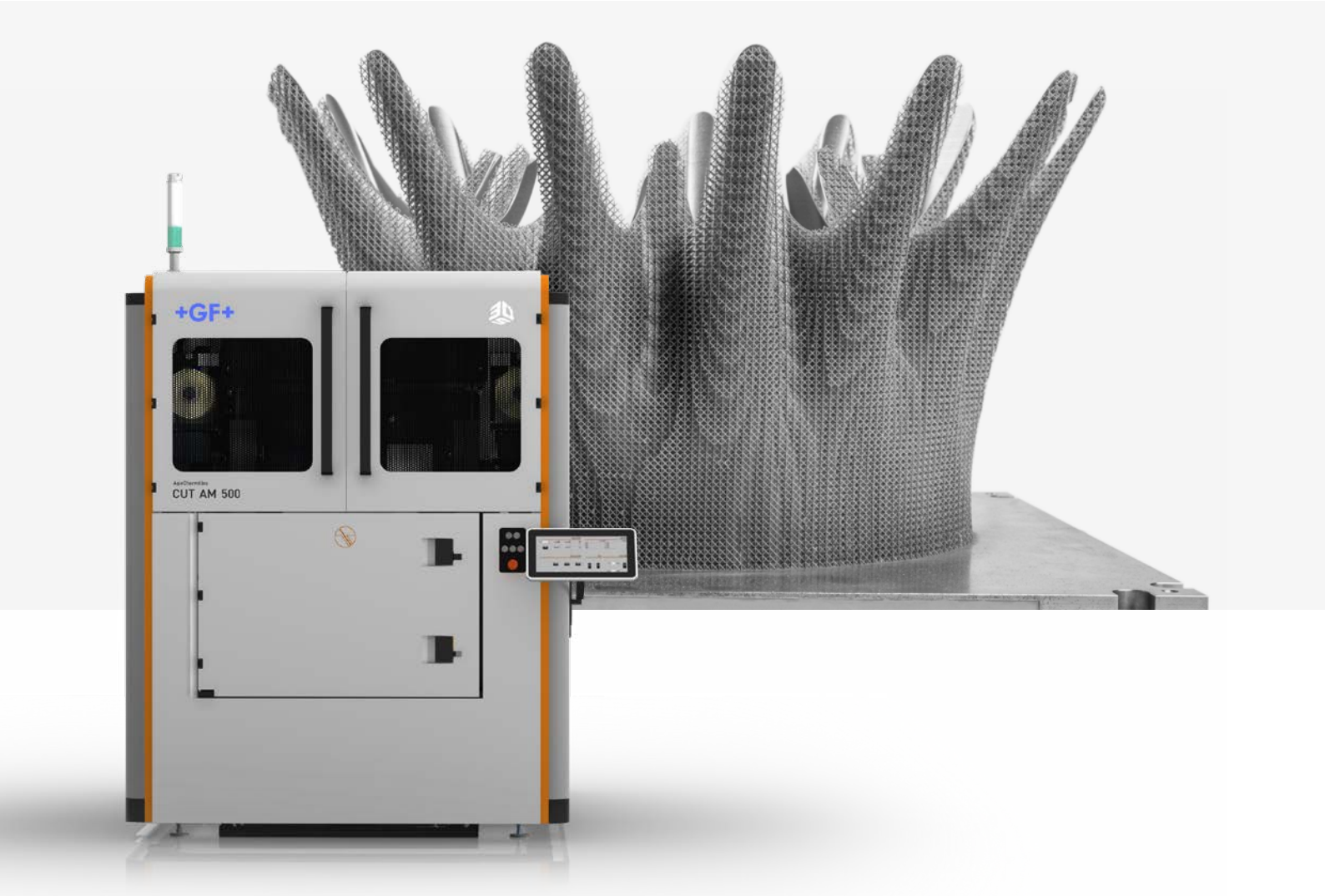
3D SYSTEMS

+GF+

AgieCharmilles

CUT AM 500

Unique EDM separation of AM parts



GF Machining Solutions: Becoming better every day – since 1802

When all you need is everything, it's good to know that there is one company that you can count on to deliver complete solutions and services. From unmatched Electrical Discharge Machining (EDM), Laser texturing, Laser micromachining, Additive Manufacturing and first-class Milling and Spindles to Tooling and Automation, all of our solutions are backed by unrivaled Customer Services and expert GF Machining Solutions training. Our AgieCharmilles, Microlution, Mikron Mill, Liechti, Step-Tec and System 3R technologies help you raise your game—and our digital business solutions for intelligent manufacturing, offering embedded expertise and optimized production processes across all industries, increase your competitive edge.

3D Systems: Advancing Industries with Additive

More than 30 years ago, 3D Systems brought the innovation of 3D printing to the manufacturing industry. Today, as the leading additive manufacturing solutions partner, we bring innovation, performance, and reliability to every interaction - empowering our customers to create products and business models never before possible. Thanks to our unique offering of hardware, software, materials, and services, each application-specific solution is powered by the expertise of our application engineers who collaborate with customers to transform how they deliver their products and services. 3D Systems' solutions address a variety of advanced applications in healthcare and industrial markets such as medical and dental, aerospace & defense, automotive, and durable goods. More information on the company is available at www.3dsystems.com.

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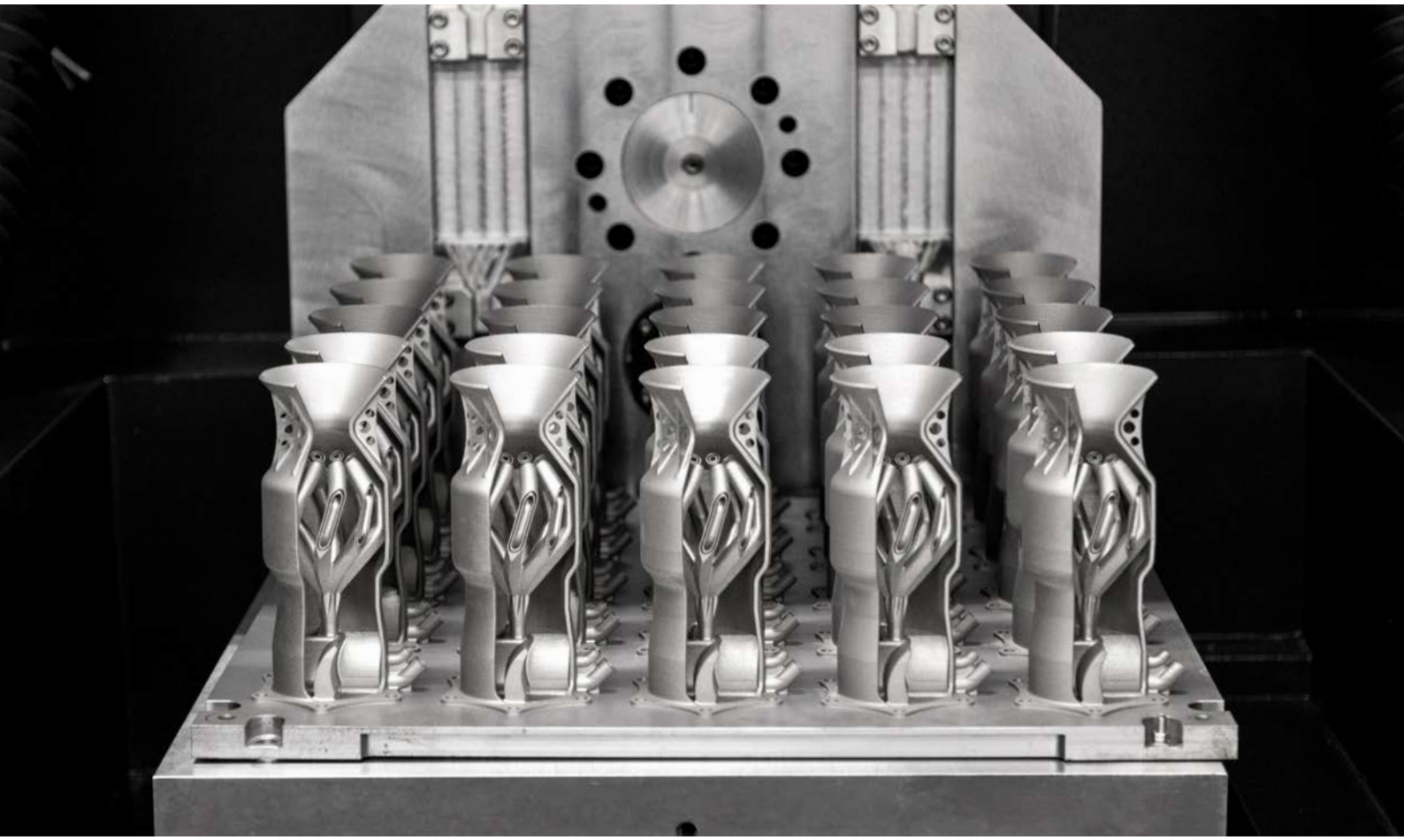


New EDM concept to support 3D printing

The universal AgieCharmilles CUT AM 500—based on GF Machining Solutions' more than 65 years of legendary EDM expertise—makes a significant contribution to the AM process: It is a fast, precise and automation-ready alternative to using standard Electrical Discharge Machining (EDM) machine or a band saw to separate additively manufactured parts from the build plate. The CUT AM 500 is the perfect complement to GF Machining Solutions' scalable, workflow-optimized DMP Factory 500 and DMP Flex/Factory 350 metal 3D printing solutions.

The CUT AM 500 resolves a number of quality barriers encountered by manufacturers who use a bandsaw to separate the workpiece from the build plate. These barriers include geometrical inaccuracy, loss of workpiece material (kerf) and damage to the part. The CUT AM 500 maintains the integrity of the part by drastically reducing part contamination and damage, an advantage that is particularly crucial in risk-averse sectors such as Aerospace and Medtech.

The separation process Key challenges

Since its introduction, the remarkable process of 3D printing has long been bedeviled by the problem of separating the 3D printed parts from the build plate...until now. The wondrously complicated 3D printed parts are useless until they can be separated from their build plate.

Separation process with a band saw

It all seemed very simple. Clamp the build plate to an angle iron and cut the parts off with a vertical band saw. However, it soon became apparent that this simple method had many limitations and drawbacks:

- **Saw kerf**
  The width of the saw cut meant that a substantial number of extra layers needed to be produced in the 3D printing process.

- **Sawed surface accuracy**
  The quality and accuracy of a sawed surface leave much to be desired, often requiring costly subsequent processing operations.

- **Delicate cross-section damage**
  Sawing forces on the parts are not insignificant and can cause damage and distortion, especially for thin wall parts.

- **Super alloy parts**
  Parts printed in Inconel and Titanium provide significant challenges for efficient sawing.

Separation process with a standard vertical EDM

While switching the process to wire-cutting EDM solved the issues of kerf, surface quality and cross section damage, other issues soon became evident:

- **Cutting performance**
  Compared to a band saw, the cutting speeds with EDM are substantially slower. One of the reasons is that high pressure flushing, normally applied with wire-cutting EDM, is defeated by the uneven cross section of many 3D printed parts and by the fact that there are often separated rows of parts being cut. In addition, due to the specific structures (e.g. lattices) enabled by AM but also because of potential distortion while cutting, wire breakages are very common. Finally, short circuits due to remaining metal powder can often happen.

- **Part integrity**
  Since the build plate needs to be mounted so its surface is parallel to the vertical wire, the parts being cut off are necessarily oriented horizontally. When they are released by the cutoff, they tip and fall, often causing damage.
  In addition, the bending moment of the weight of the part just before it is released can cause distortion of the surface near the final release.

CUT AM 500
The answer to the needs

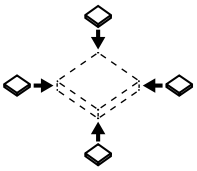
3 patents pending

Maintain part integrity
Maintain your part integrity by ensuring that your parts are undamaged during the cutting process, thanks to the tilting table, the horizontal wire EDM process and the customizable baskets.

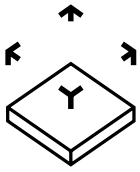
Low running cost
Reduce your running costs to the minimum level—as low as the cost level of a band saw—with our new, dedicated technology in combination with the double spool concept.

Fast separation process
Get the most reliable combination of advantages for cutting additively manufactured parts with specific support structures remaining powder. The CUT AM 500 offers unique features, including a generator enabling the fastest and most reliable EDM process.

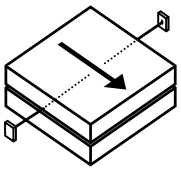
Automation-ready
Discover easier clamping and referencing as well as automation readiness with a machine layout designed for integration of a clamping system.



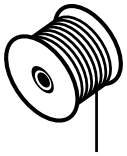
Universal solution
The CUT AM 500 is designed to cut parts printed on any powder bed fusion printer.



Built plate dimensions
The CUT AM 500 can separate 3D printed parts from large build plates with a weight of up to 500 kg.



Wire diameter
Reduce your total build time and save costs thanks to the very small diameter of the molybdenum wire.



Maximum speed
Extremely fast cutting process in comparison to standard EDM machines.

Key features

Integrated swivel axis

The structure is in L-shape. Two big thickness plates are fixed together with high strength screws to ensure high rigidity. It has a lot of different holes distributed on the horizontal plate to fix chuck and various base plates.

GF Machining Solutions' dedicated water-based dielectric

The deionized water-based dielectric is fortified with proprietary additives that enhance the "dragging effect" as well as the cutting speed. Exclusively developed for GF Machining Solutions and uniquely recommended to be used on our machine.

Collection basket (in option)

This collection basket can be used to collect the parts that have been cut in order to ensure a maximum level of protection but also in order to facilitate the part traceability. The reinforced stainless steel basket is required to collect parts with a weight above 100 kg and maximum 500 kg. The basket made of aluminum has a maximum load of 100 kg.

Simplified operation

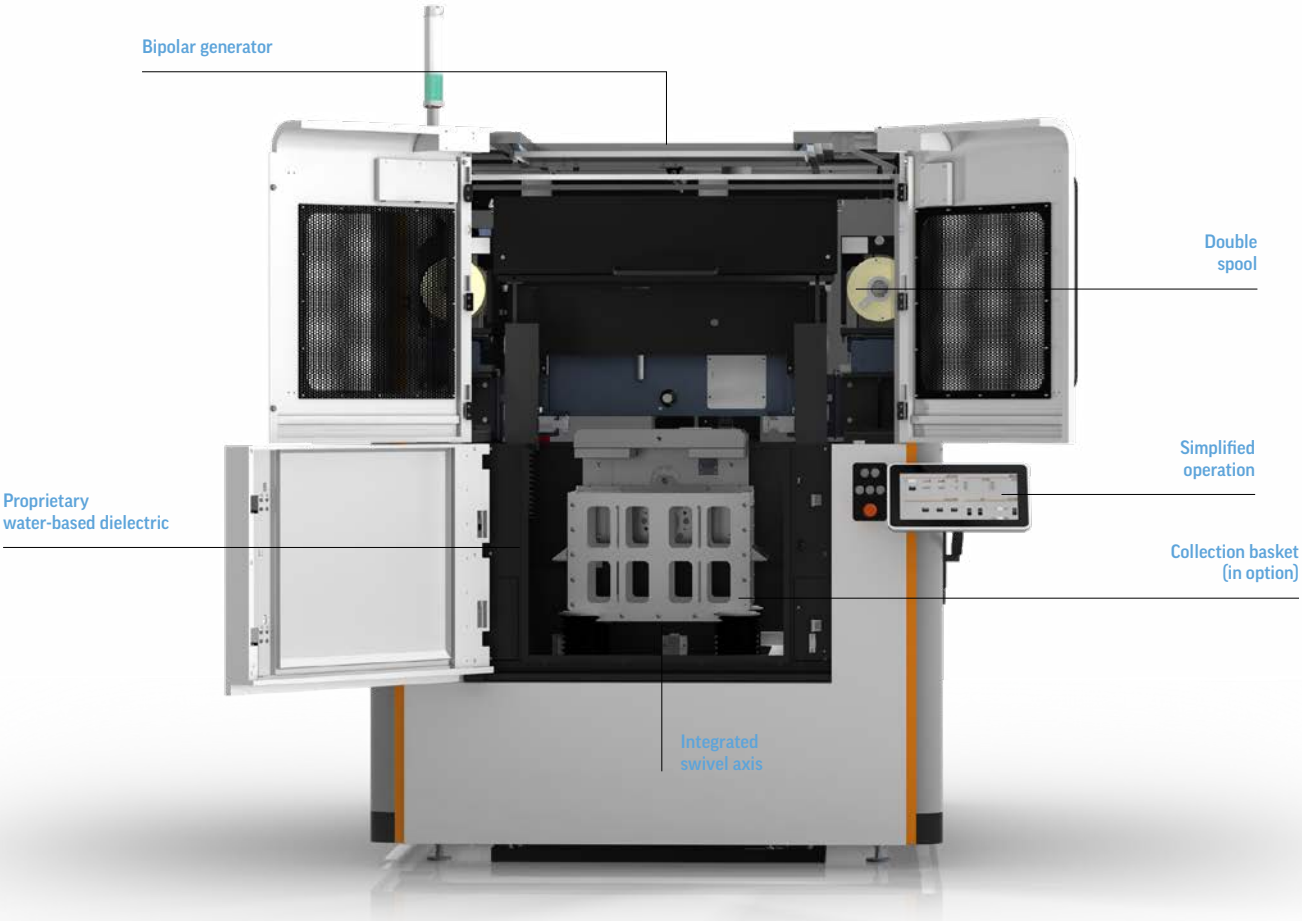
With a few simple inputs to the user-friendly HMI control panel, separation jobs are easily programmed.

Double spool wire system

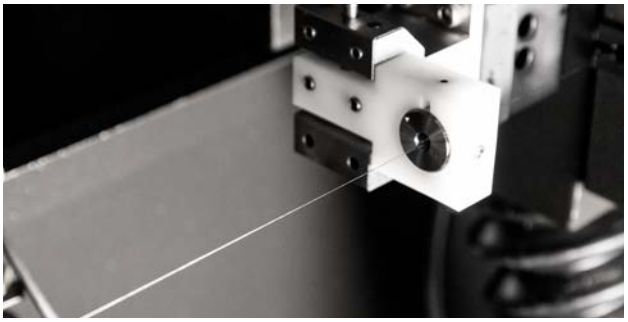
With wire traverse speed of 20 meters per second, the wire actually drags the dielectric into the cut, even for multiple parts being cut simultaneously by the wire. The CUT AM 500 reuses the wire by spooling the wire back onto another spool and then reversing direction to wind the wire back on to the original spool. This back- and- forth reuse of the wire between two spools allows for very low wire consumable cost.

Bipolar generator

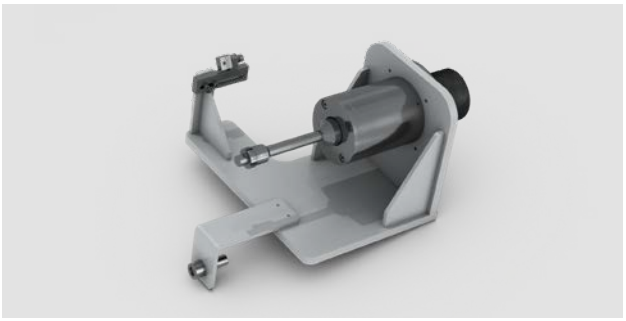
A unique generator utilizes a combined EDM/ECM cutting action that results in improved cutting speeds. This power supply utilizes Bipolar pulse technology which virtually eliminates chemical attack on titanium and other susceptible materials.



Key accessories



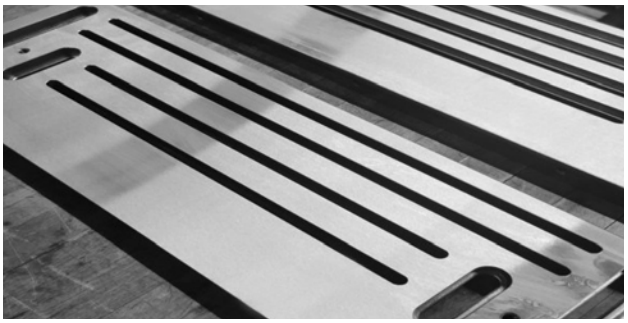
Wire guides
The wire guides extend the wire lifetime and increase the cutting efficiency.



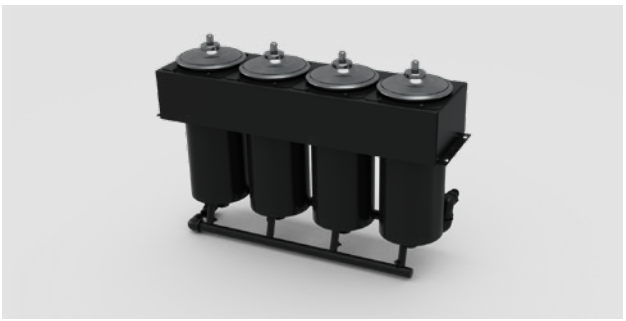
Loading/Unloading wire tool set
This set is composed by tools enabling the loading and the unloading process of the wire at a much higher speed (15 m/s versus 1 m/s) than with the standard tools.

Table-top chuck
The 4-fold Baseplate is a table-top solution composed with four System 3R DelphinCompact chucks. It is sitting centrically on the worktable. It allows for a faster set-up and an easier clamping.

Top window
The top window enables the operator to close or open the top of the working area. It can be managed automatically from the HMI. The top windows leads to better performance of a mist extraction system.



Adapter plates
The adapter plates can be fixed on top of the tilting platform and they allow the operator to easily fix base plates of different sizes.



Extended filtration system
The extended filtration system (composed by four filters versus two filters as standard) enlarges the capacity of the filtering system and leads to a longer lifetime and less maintenance.

Most efficient solution for medium-size plates

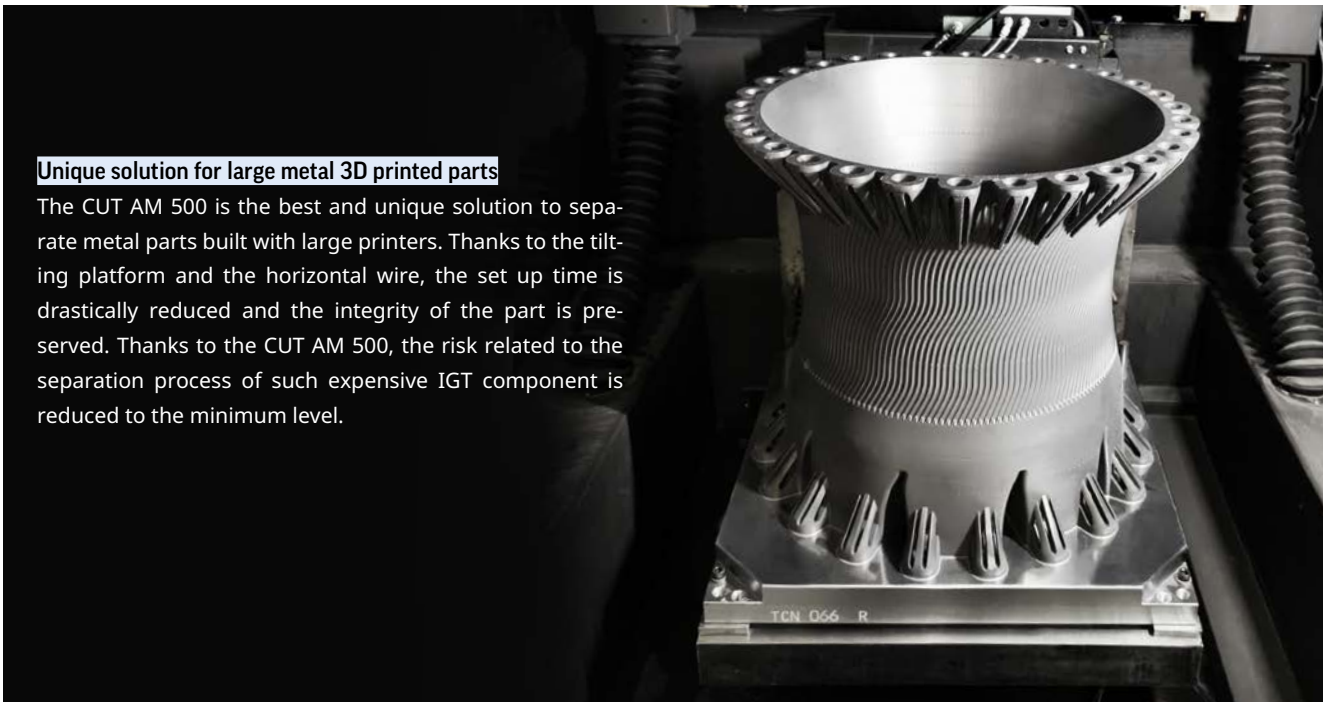
Cutting rate
3-4x faster
than a standard EDM

Total leadtime*
3-4x faster
than a bandsaw

Total Cost of Ownership
3x cheaper
than a standard EDM

Total Cost of Ownership*
6x cheaper
than a bandsaw

These figures are based on real case studies with
various geometries printed in maraging steel, nickel alloys and titanium.
* including building process



Unique solution for large metal 3D printed parts

The CUT AM 500 is the best and unique solution to separate metal parts built with large printers. Thanks to the tilting platform and the horizontal wire, the set up time is drastically reduced and the integrity of the part is preserved. Thanks to the CUT AM 500, the risk related to the separation process of such expensive IGT component is reduced to the minimum level.

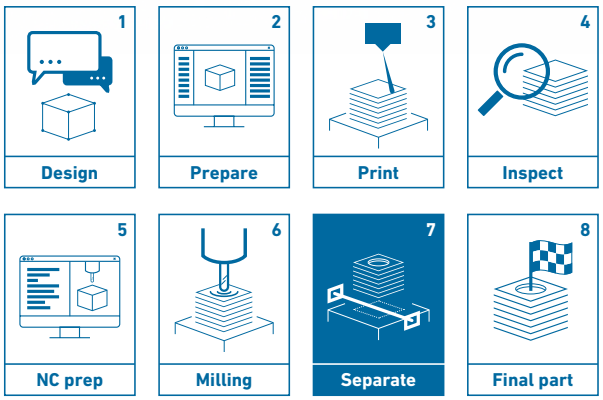
The perfect complement to our DMP metal printers!

DMP Flex 350

DMP Factory 500

Simplify AM technology integration

GF Machining Solutions and 3D Systems offer 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.



Accelerate your production to new levels of success

High cutting performance, low running costs and elimination of contamination

To give optimal performances the machine is designed to work with molybdenum wire. Such material offer good trade off between tensile strength, wear and cutting speed. The wire in 0.20 mm allows to limit the need for printing additional material due to the cutting gap. The solution we offer has advantages in medical and aerospace applications where the contamination of the surface by copper and zinc can be an issue.

We propose our certified wire AC Cut AM in 0.20 mm with 2 different lengths of 5000 m and 10000 m. With a 5000 m spool, it is possible to use the same spool up to 600 hours, and up to 1200 hours for the 10000 m. To achieve optimal performance, we recommend to use the AC Cut AM wire certified by GF Machining Solutions on the CUT AM 500.

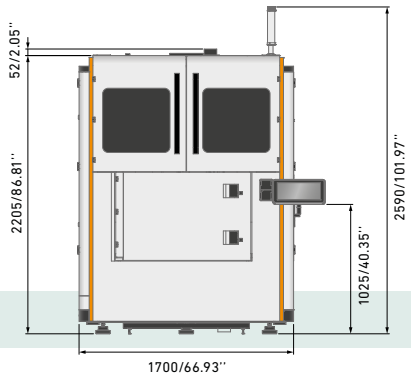
Dedicated and exclusive dielectric

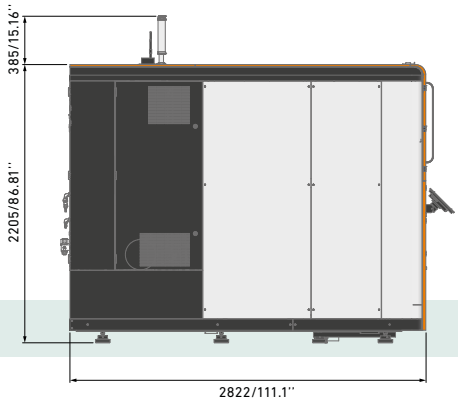
The exclusive and dedicated GF Machining Solutions water-based dielectric AC CUT AM 500 Concentrate has been developed to maximize the erosion performance and minimize costs. AC CUT AM 500 concentrate is the unique and only recommended product to guarantee and secure the best cutting speed and performance on your machine.

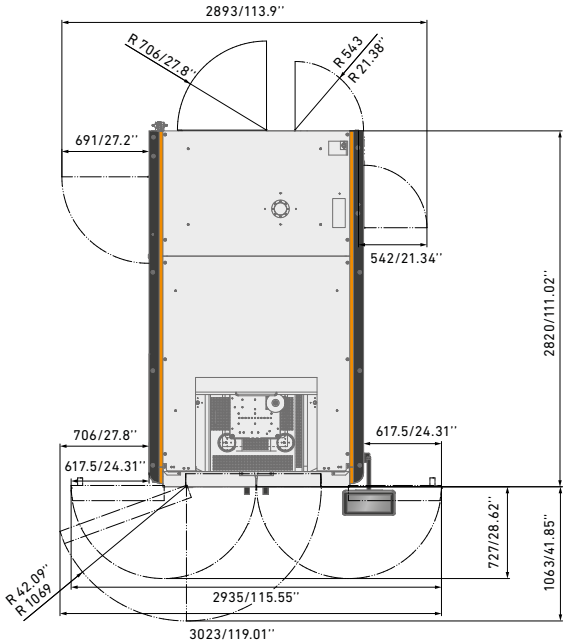
Technical specifications

CUT AM 500	
Specifications	
Dimensions of complete equipment (W x D x H)	1700 x 2953 x 2224 mm (66.93 x 116.26 x 87.56 in)
Total weight of equipment with dielectric	4120 kg (9083 lb)
Tank volume	900 l (237.75 gal)
Cutting specifications	
Max. part dimensions	510 x 510 x 490 mm (20.08 x 20.08 x 19.29 in)
Max. part weight (base plate + parts)	500 kg (1102 lb)
Y, Z travel	650 x 200 mm (25.59 x 7.87 in)
Y, Z measurement resolution	0.1 µm (3.94 µin)
Speed of axis movement	0-2000 mm/min (0-78.74 in/min)
Wire type	Molybdenum 0.2 mm (0.008 in)
Max. machining speed	240 mm²/min (9.45 in²/min)
Min. roughness (according to geometries and technologies)	Ra 6 µm (236.22 µin)
Accuracy	± 0.1 mm (± 0.004 in)

CUT AM 500







Additive Manufacturing Solutions

Metal

Direct Metal Printing (DMP): a metal additive manufacturing technology in which a high-powered laser scans over a bed of fine metal powder to micro-weld particles in the pattern prescribed by a cross-section of the CAD file. 3D Systems' precision metal manufacturing solutions integrate DMP with thoroughly tested print parameters for LaserForm materials, 3DXpert all-in-one software, and expert application support.

Full Color

ColorJet Printing (CJP): a binder is selectively jetted from inkjet print heads onto a powdered core material, causing the core to solidify. The build platform lowers with each subsequent layer, and CMY or CMYK color is applied to the outermost surfaces resulting in a full-color 3D model.

Application Innovation Group

3D Systems' Application Innovation Group can help you solve your most difficult design and production challenges with additive manufacturing solutions. This team of experienced applicaton experts can help identify your needs, working with you to optimize your designs, prototype, validate and define a manufacturing flow.

Plastic

Selective Laser Sintering (SLS): a high-powered laser selectively fuses powdered material, layer-by-layer. SLS machines are available in large build sizes and compatible with robust materials to enable durable, high-heat and chemically resistant applications.

Stereolithography (SLA): a UV laser scans over a layer of liquid photopolymer material to build up a part. SLA delivers the highest accuracy and smoothest surface finish of all 3D printed parts and is available in large build platforms with high resolution settings.

Figure 4 Technology: a projector images each layer of a build within a UVcurable, liquid material. Figure 4 offers precise, cost-efficient printing at fast throughput speeds, with six sigma repeatability.

MultiJet Printing (MJP): a printing process that uses piezo printhead technology to deposit either photocurable plastic resin or wax casting materials, layer-by-layer. These high resolution printers are economical to own and post-processing is virtually hands-free, enabling delicate and complex features to be printed and cleaned without damage.

Software Solutions

Geomagic Design X™, Geomagic Wrap® and Geomagic for SOLIDWORKS® Scan-to-CAD Software reverse engineering with 3D scanning and can introduce dramatic time savings in product design and yield more accurate and customized final products.

Geomagic Freeform®, 3DXpert for SOLIDWORKS, 3DXpert, 3D Sprint®, 3D Systems' design products help accelerate and optimize designs across organic shapes, tooling design and dedicated solutions for Design for Additive Manufacturing (DfAM). Robust and diversified toolsets help users bring new and innovative ideas to life with application-specific tools to fast-track and fine-tune projects.

Geomagic Control X™ 3D Inspection Software 3D metrology and automated digital inspection tools verify design intent, ensure quality outcomes, and facilitate reporting in a streamlined process that can save significant time and money.

Healthcare & Dental Solutions

3D Systems partners with surgeons, healthcare professionals, medical device manufacturers, and medical teaching staff to offer a range of precision healthcare solutions, including virtual reality simulators, 3D printed anatomical models, VSP® (Virtual Surgical Planning), patient-specific surgical guides, instrumentation and implants. In the world of digital dentistry, 3D Systems offers a broad range of clinically validated technologies and materials that allow dental labs to access advanced digital workflows, driving speed, efficiency and precision of a range of indications delivered to patients.

Customer Support

With locations worldwide, 3D Systems offers best-in-class end-to-end support and services across the globe. 3D Systems' highly trained application engineers and field service technicians are available to assist customers at any stage: from the design phase and technology selection, to machine installation and maintenance.

More information on **www.3dsystems.com**

Multi-technology solutions provider

Our commitment to you and your specific applications is proven by the value-adding 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-cutting 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.

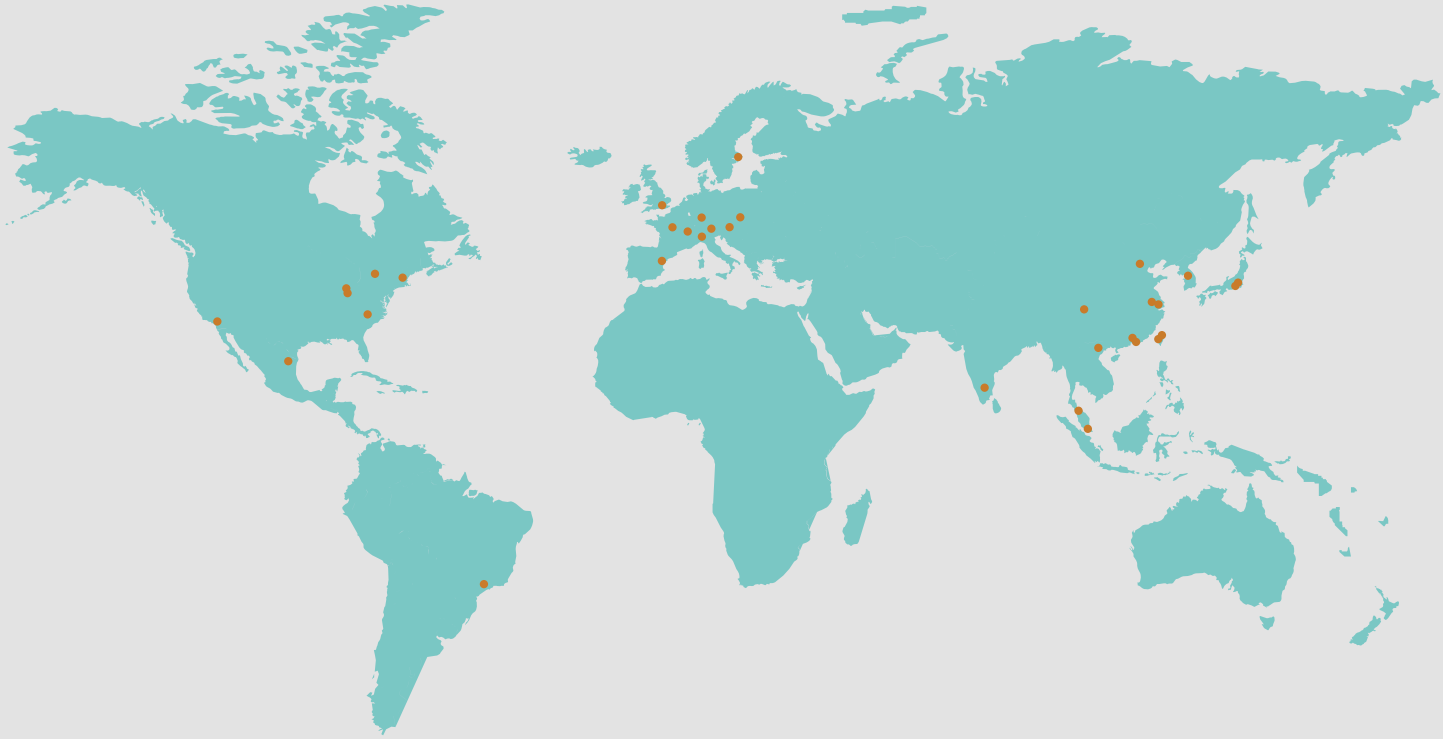
Software

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.

Worldwide for you



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