

# Fon Mag<sup>+</sup>

## EXPO EDITION

Featuring plenty of world premieres  
set for Formnext 2023

## MORE AND MORE APPLICATIONS

...in numerous industries (including electronics) thanks to new, specialized innovations along the entire process chain

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## ESSENTIAL PARTNERS

AM service providers are often indispensable for OEMs – and Formnext's Service Provider Marketplace will show you why

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mesago

formnext





## Reduction of particulate dust through laser cladding of brake discs

Wear protection coatings for automotive brake discs? What has been barely applied for the longest time could now become the new standard in the near future. The reason for this is that the particulate matter resulting from the abrasion of brake discs is about to be regulated. For example, the Euro 7 emissions standard, due to come into force in the summer of 2025 and that incorporates specific limit values for brake dust for the very first time. One of the most effective measures for complying with these limits will be the application of anti-wear coatings, a.k.a. claddings, that both sustainably reduce abrasion and increase the service life of brake discs. However, the thermal spray coatings used to date are both too expensive and too complex for the mass market. Therefore, it has only found use in isolated cases in the premium segment.

Powder deposition welding resp. cladding is meanwhile an established and industrially proven process that enables cost-effective series coating of automotive brake discs and that achieves convincing results. Commercially available gray cast iron brake discs can be produced with hard coatings from a thickness of approx. 50  $\mu\text{m}$  – these coatings are metallurgically fusion bonded

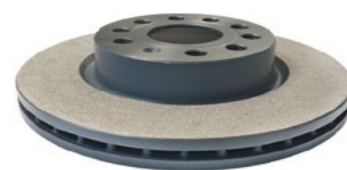


to the gray cast iron and are therefore far more corrosion-resistant than thermal spray coatings that adhere solely by mechanical bonding. Due to its low preparation requirements, outstanding energy and material efficiency, and high area coverage rates, the laser-based process is also economically superior to thermal spraying. It is suitable for mass production in the mass market without any downsides, so that even small cars or

compact-class vehicles can be equipped with coated brake discs without any drawbacks. The acquisition costs are somewhat higher than for classic automotive brake discs but are amortized by the extended service life.



For brake disc coating/cladding, Laserline developed a process set-up that enables very short process run times. The disc is moved under the processing optics at speeds of up to 400 m/min and coated on both sides simultaneously. Depending on the size of the disc, the coating material and the thickness of the coating, the coating can be applied in less than one minute. The diode laser melts the gray cast iron very evenly, so that there is only a slight mixing of base and coating material. For reliable series production, all machine components and the actual process are closely monitored: The monitoring extends from



the melting bath to the powder supply, the cooling water temperature and the scattered light, right through to the process emissions and laser power. Irregularities are registered immediately, and affected brake discs are discarded.

The hard-coated brake disc will thus contribute to a noticeable improvement in the air we breathe, in particular in urban areas. Both brake pad and brake disc wear are minimized – an additional benefit for every car owner.

## EDITORIAL

It's almost time! The annual highlight on the global AM community's calendar is just around the corner, and I can hardly wait for the doors to open at Formnext on 7 November and welcome the who's-who of Additive Manufacturing to Frankfurt am Main. For four days, the whole »fAMily« will come together for an in-depth meeting of the minds with one goal in particular: pushing the limits of AM in industrial production even further.

In recent years, Additive Manufacturing has advanced into a technology that demands to be taken seriously in many areas of use, even achieving readiness for series production in some instances. As a business case, it has also proven to be an intriguing new alternative (or an ideal complement) to conventional technologies. AM offers a number of advantages with regard to sustainability, as well; we'll be presenting plenty of inspiring ideas and solutions in connection with the Nordic region, which we've partnered with this year.

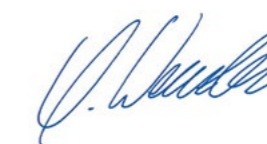
The new creations our exhibitors are set to unveil at Formnext 2023 will show that the AM industry has grown up even more and become increasingly diverse. Practically every day brings more specialized innovations that range from material and software to 3D printers and post-processing solutions. Both young and more established companies – see Reinforce3D (p. 8), Bosch (p. 10), or D3-AM (p. 18), for instance – continue to amaze us with their exciting new technologies.

AM systems are thus taking on entirely new dimensions, in terms both

large and small. The cover of this issue features an example of tiny components that were produced using highly precise 3D-printing techniques from Nano Dimension (p. 10). Meanwhile, large-scale metal printers can be used to manufacture components weighing tons; AMCM (p. 15) and Eplus3D (p. 13) will be among the exhibitors showing how it's done at Formnext.

Increasingly fine-tuned solutions are enabling Additive Manufacturing to expand into more and more application areas by delivering the necessary high-quality parts. This edition of our Formnext Magazine is meant to give you a sneak preview of innovations in multi-material printing for the field of medicine, 3D printed machine frames, sustainable materials (made from algae, for instance), and much more besides.

As ever, Formnext is your chance to experience countless new products and innovations in person, along with exciting conversations with plenty of interesting people. I look forward to seeing you there!



Sincerely, Sascha F. Wenzler  
Vice President Formnext





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# FORMNEXT NEWS

## FROM CONSTRUCTION TO AEROSPACE

Formnext 2023 is poised to raise the bar in a number of ways – including in terms of the topics covered. Its supporting program will be more extensive than ever before and delve into an array of user industries ranging from construction and mechanical engineering to aviation and aerospace. Featuring multiple stages and the Service Provider Marketplace for the first time, the schedule will also include expanded versions of established events.

The Service Provider Marketplace will be one of the highlights of the 2023 supporting program. This showcase, which is being organized in cooperation with Daimler Truck and Daimler Buses, will use a series of automotive examples to demonstrate the successful use of AM and the importance of service providers in the field. Formnext has also partnered with the Nordic region this year to illustrate the potential of AM in Denmark, Sweden, Norway, and Finland. These countries, which are also at the forefront of the sustainability movement, will be presenting numerous AM-based innovations along with around two dozen Nordic exhibitors.

### AEROSPACE, RAIL TRANSPORT, AND SUSTAINABILITY

Formnext has also made advances in its conference concept. This year, the presentation program in the exhibition halls will be spread across three stages (the Industry Stage, Application Stage, and Technology Stage) for the first time and cover key applications, trends in AM, and innovations from exhibitors. On the Application Stage, well-known users of AM technology from across the globe will show how they are using Additive Manufacturing to drive the advancement of their own innovations. These range from shoe production and the printing of textiles for the fashion world to 3D printed electronics, components for airplane

cockpits, and robot-assisted 3D Printing on the moon. The topic of aerospace will also be covered by high-ranking representatives from NASA's Marshall Space Flight Center and MT Aerospace.

When it comes to high speeds both in production and out on the open road, Audi and the Formula One team BWT Alpine are just the people you want to consult. They will also be on hand on the Application Stage to demonstrate how they get the most out of AM. Meanwhile, the latest 3D-printing innovations from the world of rail transport are no less exciting. Experts from Austria (ÖBB Train Tech), France (SNCF Réseau), and Germany (DB Fahrzeuginstandhaltung GmbH) will be reporting on how these inventions are bringing the benefits of AM to the railways of Europe.

Along with another important topic – investment – sustainability will also be an area of focus on the Industry Stage, where Equinor, Lego, Danfos, Grundfos, and other renowned companies from the Nordic region will be talking about how they are conserving resources with Additive Manufacturing.

Finally, the line-up on the Technology Stage reads like a who's-who of the AM world. Leading manufacturers and numerous young companies are set to show off the new creations and world-firsts they are bringing to Formnext 2023. Attendees can look forward to a great many innovations in a condensed format.

### BUDDING INNOVATIONS

The supporting program at Formnext 2023 also includes a series of established events that have been expanded to meet the considerable demand they have enjoyed in years past. The Formnext Start-up Challenge, for example, will be presenting awards to promising and innovative business ideas for the ninth time. The exhibitors in the Start-up Areas will also introduce themselves as part of Pitchnext, and other young, innovative start-ups will be on hand at the »Young Innovators« booth, which is being organized by the Federal Ministry of Economic Affairs and Climate Action (BMWK).



### MECHANICAL ENGINEERING AND AM FOR BEGINNERS

The Additive Manufacturing workgroup of the industry association VDMA is organizing its own showcase of useful AM applications from the world of mechanical engineering.

For companies looking to enter the AM industry, excellent insights and advice will be provided by the well-established Discover3D-printing seminars, which will be held every day in cooperation with ACAM.

Elsewhere at Formnext, the BE-AM Showcase will highlight the latest additive developments in the construction industry. At the same time, the BE-AM Symposium will be presenting plenty of background information and future developments related to AM.

### SUPPORTING PROGRAM HIGHLIGHTS:

- BE-AM Showcase** Hall 11.0-F49
- BE-AM Symposium** 8 November, 9:00 am – 5:00 pm, Portalhaus, »Transparenz« room
- Service Provider Marketplace** Hall 12.1-B101
- Nordic Pavilion** Hall 11.0-D68
- Start-up Areas** Halls 11.1-B55 and 12.0-B81
- VDMA Showcase** Hall 12.0-B01
- Young Innovators pavilion by BMWK** Hall 12.1-B39

### + FURTHER INFORMATION:

- » [formnext.com/program](https://formnext.com/program)
- » [formnext.com/fonmag](https://formnext.com/fonmag)



## EXHIBITOR NEWS

### CERAMIC AND METAL IN THE SAME LAYER

At Formnext 2023, Lithoz will be presenting its latest innovations in multi-material 3D Printing and many multi-functional parts, all of them printed using the CeraFab Multi 2M30 that will have its world premiere at the trade show. This 3D printer is capable of combining different materials, such as ceramic and metal, ceramic and polymer, and different ceramics in the same functional part – and even in the same printed layer. This means very different material properties can be flexibly and functionally combined – including conductive and insulating characteristics – which opens the door to the future of multi-material 3D Printing and the entire ceramic industry. These multi-material parts will also be available for visitors to pick up and examine for a real hands-on experience.

With the growing demand for ceramic 3D Printing at an industrial scale now evident across various sectors, the success of Lithoz's partners and technology in serial production

will also be on display at its Formnext booth. A broad showcase of parts produced by users of Lithoz's LCM technology – including Steinbach AG, Bosch Advanced Ceramics, Fraunhofer IKTS, and many more – will highlight this year's most successful achievements using the scalable LCM process and prove how rapidly ceramic 3D Printing has grown in industrial use.

Following the overwhelming interest in 3D printed healthcare applications using technical ceramics at last year's Formnext, Lithoz will be demonstrating even more cutting-edge innovations in 2023. Alongside a range of perfectly natural-looking lithium disilicate dental restorations, these will include a special display of bioresorbable ceramics such as hydroxy apatite, tricalcium phosphate, and multi-material medical parts.

**Lithoz at Formnext 2023:**  
Hall 11.1, Booth D48



### OVERHANGS OF UP TO 15 DEGREES WITHOUT SUPPORT STRUCTURES

Trumpf has further developed its TruTops Print 3D-printing software. The software ensures that the optimal strategy is used to expose different areas of components in each individual case. This enables 3D Printing with overhangs of up to 15 degrees without support structures. »Thanks to the new version of TruTops Print, we hardly need any support structures in 3D Printing. This saves build time and material.« says Lukas Gebhard, process developer in Additive Manufacturing at Toolcraft. »Support-free printing means we barely have to rework the parts at all. We can now realize components and projects that were previously impossible to implement, such as the near-net-shape production of large-diameter internal cooling channels.«

Previously, 3D Printing users had to print support structures to anchor their parts to the build plate during printing. These structures

also dissipate heat from exposed components and prevent the warpage caused by internal stress. Even with materials that are difficult to process (such as stainless steel), Trumpf says that 3D Printing without support structures is possible in many cases with TruTops Print.

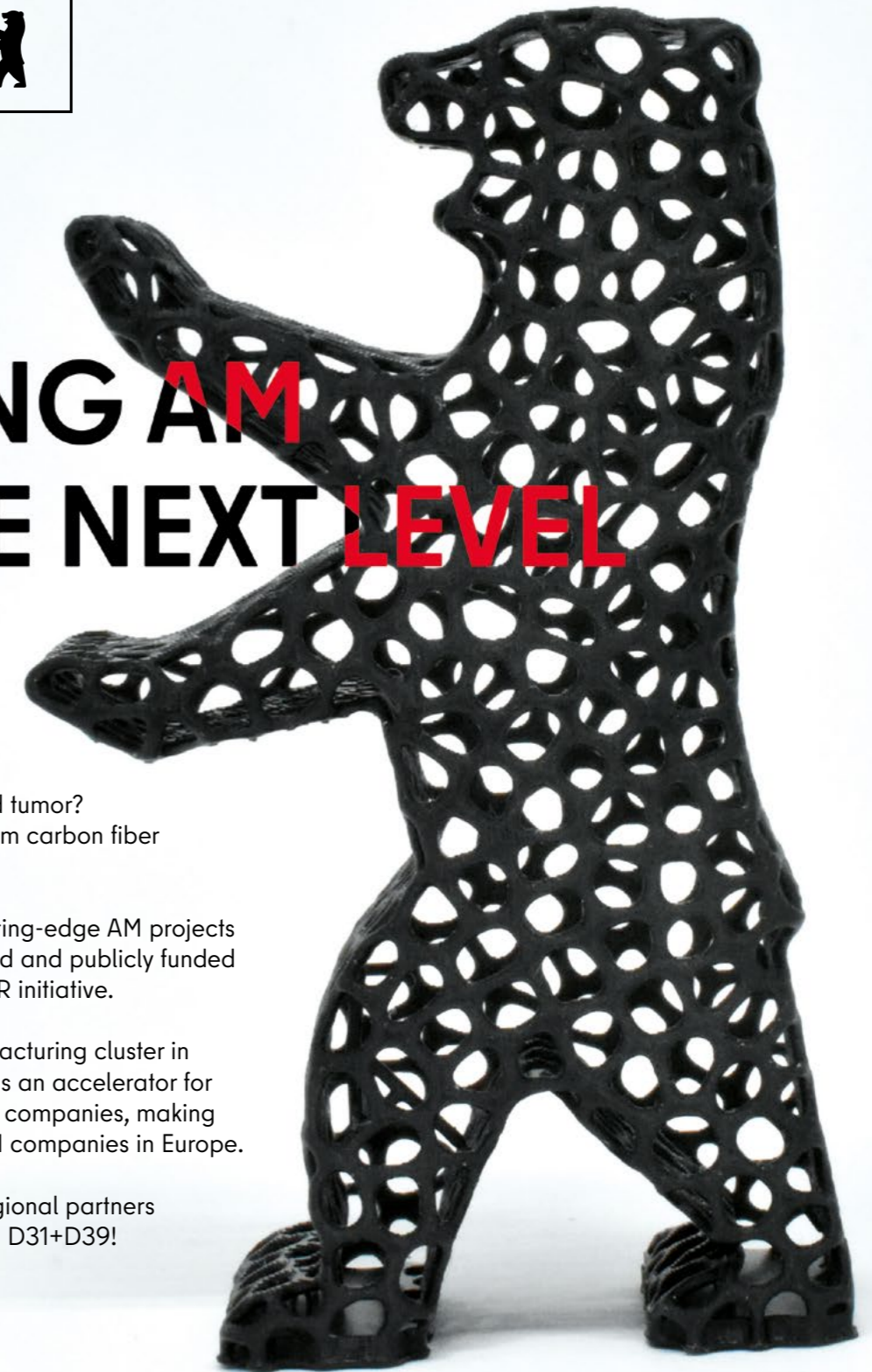
**Trumpf at Formnext 2023:**  
Hall 12.0, Booth D81



Images: Lithoz, Trumpf



## MOVING AM TO THE NEXT LEVEL



Have you ever seen a printed tumor?  
Or how a house is printed from carbon fiber reinforced concrete?

These and a dozen other cutting-edge AM projects are currently being developed and publicly funded in Berlin as part of the AMBER initiative.

AMBER is the Additive Manufacturing cluster in the capital region and acts as an accelerator for a large number of innovative companies, making Berlin the first address for AM companies in Europe.

Visit us and more than 20 regional partners at Formnext in hall 11.1, booth D31+D39!

**AMBER**  
ADDITIVE MANUFACTURING  
BERLIN-BRANDENBURG





## EXHIBITOR NEWS

### REINFORCING AFTER PRINTING



fiber injection, which results in a continuous fiber connection and extremely high connection performance. By integrally joining continuous fibers, large structures can be created with stronger bonds than those made with solvents and adhesives. Reinforce3D sees great potential for its technology in the aerospace, automotive, sports, and construction sectors, among others.

**Reinforce3D at Formnext 2023:**  
Hall 12.0, Booth B119



The Spanish start-up Reinforce3D has developed a new manufacturing technology for fiber-reinforced components, the Continuous Fibre Injection Process (CFIP), and will be showcasing its new Delta machine at Formnext 2023.

CFIP reinforces 3D printed components with continuous fibers by injecting tubular cavities into them. Resin containing the fibers is then injected deep into these cavities, where they strengthen the structure of the part after the resin has cured.

In addition to carbon fibers, CFIP can also process glass or aramid fibers, among others. In the future, Reinforce3D also wants to process other types, including natural fibers. According to the manufacturer, CFIP is the first technology that reinforces components not during production, but after.

Furthermore, CFIP allows fibers to be placed in all directions and in complex paths, including between printed layers. In addition to reinforcement, the technology enables the integral connection of different parts through

### A STREAMLINED CALIBRATION PROCESS

BLT (Bright Laser Technologies) will present its BLT-S400 metal printer with automatic powder recovery at Formnext 2023. According to the manufacturer, the new system's three-laser configuration makes it suitable for high-volume production of industrial parts. In addition, the BLT-S400's newly developed automatic splicing calibration module significantly reduces the need for manual intervention, which streamlines the calibration process. The automatic splicing calibration program ensures precise alignment through its multi-laser system, consistently guaranteeing a

controllable accuracy of 0.02mm. The BLT-S400's new powder recovery system ensures the safe transfer, recovery, sieving, and reuse of metal powders within an on-site test laboratory. The system thus facilitates the seamless and secure transfer of large volumes of 3D Printing powders from containers to multiple machines, which eliminates the risk of spillage, contamination, explosion, and contact with workers.

**Xi'an Bright Laser Technologies at Formnext 2023:**  
Hall 11.0, Booth E 11



Images: Reinforce3D, Xi'an Bright Laser Technologies, ZRapid

## EXHIBITOR NEWS

### AN OPEN MATERIAL PLATFORM

In cooperation with its European sales partner, Anima (Athens, Greece), the Chinese manufacturer ZRapid Technologies is set to unveil its large-format metal printer iSLM350D in Europe along with its AFS-420 metal powder circulation unit. The company will also be showcasing its entry-level metal printing model, the iSLM160, and its iSLA660 SLA printer. Founded in Suzhou in 2011, ZRapid says it now has one of the largest production and R&D centers in China. The iSLM350D features a pressure range of 350 x 350 x 450mm and a dual-laser configuration. Among other advantages, its gas flow design can remove black smoke, oxidation slag, and particle splash



generated during the molding process and keep the powder level clean. The printer's three-stage filtration system also provides for efficient dust removal up to filtration level H13. In addition, the iSLM350D serves as an open material platform thanks to its ability to manually edit G-codes for custom printing strategies. Different printing modes such as »quality mode« and »fast mode« are also selectable with optimized parameters for different materials.

**ZRapid & Anima at Formnext 2023:**  
Hall 11.1, Booth A38 & B39

generated during the molding process and keep the powder level clean. The printer's three-stage filtration system also provides for effi-

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**FORMNEXT 2023**

HALL 12.0 - BOOTH D48

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## EXHIBITOR NEWS

### PRINTING »UNPRINTABLE« MATERIALS FOR INJECTION MOLDING

For generations, injection molding has been a proven method of producing inexpensive and reliable plastic parts. Bosch Industrial Additive Manufacturing is now taking advantage of injection molding granules for AM and will be presenting a corresponding 3D printer for the first time at Formnext 2023, along with its patented printing process. The company wants to make 3D Printing scalable while also utilizing materials that were previously unprintable. In doing so, Bosch is employing in-house software and other appropriate resources.

Currently, injection molding pellets made of materials such as PA6 GF30 (polyamide with a glass fiber content of 30 percent), PP GF50 (polypropylene with a glass fiber content of 50 percent), and PA6 GF 25 FRT (a polyamide 6 PA blend with 25-percent glass fiber content that is certified flame-retardant) can be printed. Bosch is also promising more injection molding granules and features in the near future.

**Bosch Industrial Additive Manufacturing**  
at Formnext 2023: Hall 12.1, Booth C41



### FOR MINIATURIZED PARTS IN ELECTRONICS OR INJECTION MOLDING

Nano Dimension's Fabrica Group will be showcasing its expanded range of micro-AM solutions, new materials, and open-source plans at Formnext. The company will also be presenting recent customer prints that demonstrate the use of its micro-AM platforms in new application areas. Fabrica Giga machines will also be making their trade fair debut at this year's Formnext: The Giga 250 has a build volume of 6 x 9 x 45mm, while the Giga 25 has a build volume of 12 x 18 x 45mm. Both machines offer micron-scale resolution. Fabrica Group, which was acquired by Nano

Dimension in 2021, recently launched a new line of materials it plans to show off at this year's show: P-900 from the Performance series, D-810 from the Durable series, and T-700 from the Transparent series. The Performance series is suitable for miniaturized parts in fields like electronics or injection molding. P-900 is a high-resolution, ceramic-loaded composite material with excellent mechanical properties. The Durable series of materials offers both rigid and semi-rigid options, making it suitable for high-volume production of smart devices, for example. The newly intro-

duced D-810, meanwhile, is a durable, versatile, ABS-like material. Fabrica Group has also announced an open material policy, meaning the company will certify materials from third-party suppliers. Customers who want to use their own materials will receive guidance to ensure usability. Among other things, Fabrica Group hopes this will enable scientists to explore entirely new materials in the field of micro 3D Printing.

**Nano Dimension at Formnext:**  
Hall 11.0, Booth D19



Images: Bosch Industrial Additive Manufacturing, Nano Dimension

## INTELLIGENT AUTOMATION OF POST-PROCESSING

Grenzebach is making AM processes fit for series production



Additively manufactured components often require manual post-processing, which can involve everything from simply removing powder or support structures to heat treatment, surface finishing, sorting, dyeing, and quality inspection. As AM sees more and more use in industrial series production, automating these processes is becoming increasingly important as a means of maintaining a constant level of quality and reducing component costs.

According to the second annual Trends Report from PostProcess, such activities also account for 47 percent of corresponding production costs – and yet companies often overlook the post-processing phase when considering which 3D printer to purchase. »That needs to change,« says Oliver Elbert, head of Additive Manufacturing at the international mechanical engineering group Grenzebach. »To remain competitive in the market over the long term, companies are also going to have to automate post-processing in their series production.«

Specialized automation solutions can minimize manual steps, lower costs, and bring about sustained increases in productivity. »Compared to the preparation and printing phases, however, we're still seeing the lowest level of automation in post-processing,« Elbert continues. »That's actually where we believe companies can achieve the most benefits for the money they invest.«

their production costs. This is why solutions from Grenzebach are drawing considerable interest from 3D printer manufacturers that want to add automation technology to their portfolios. At the same time, Grenzebach also offers a range of benefits to those who are already engaged in Additive Manufacturing and want to automate the processes involved.

#### FROM REMOVAL TO QUALITY CONTROL

Thanks to its experience in supporting numerous industries as a full-service automation provider, Grenzebach is a partner companies can rely on when making the leap to fully automated powder-based AM. The automation equipment it provides covers everything from exchange solutions for automated printer insertion and removal, dependable depowdering systems, driverless transport vehicles and containers, machine fitting, robotic cells with bin-picking capability, and inspection solutions.

Meanwhile, Grenzebach also works closely with a variety of printer manufacturers – EOS, for example, with which it has developed a shared modules solution for automated post-process chaining. The group is actively involved in research projects like NextGenAM and Polyline, as well. Production facilities in Germany, Romania, the United States, and China and further service locations around the world enable it to provide local support and assistance almost anywhere.

**Grenzebach at Formnext 2023:**  
Hall 11.1, Booth 111-C61



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#### UP TO A 70-PERCENT REDUCTION IN PRODUCTION COSTS

By leveraging intelligent automation and integrating individual process steps in AM, companies can save as much as 70 percent on



## EXHIBITOR NEWS

### THE WORLD'S LARGEST LCD PRINTER



**P**hotocentric will unveil the world's largest LCD printer, the Liquid Crystal Titan, for the first time at Formnext 2023. The Titan combines a build volume of 700 x 395 x 1200mm with high resolution, achieving a pixel pitch of 91 microns across its entire surface. The 8k (7660 x 4320 pixels) screen provides control of over 33 million pixels, which makes it possible to convert huge amounts of liquid into solid material in a short time. The Titan printer uses free radical (not cationic) curing resin, which hardens in daylight rather than UV light. This means it cures more consistently across a large surface area and delivers more controlled double bond conversion. The resin is also printed from the bottom up rather than from the top, which Photocentric says eliminates the need for very expensive resin containers and facili-

tates more rapid resin changes. The user interface software, meanwhile, is an updated version of the free Photocentric Studio. »We intend to change the way large parts are made. Marketing it with the intriguing line »It's all about the price tag«, we're providing a transparent cost model to encourage wider applications in large format printing,« says Agustin Soriano, sales director at Photocentric.

**Photocentric at Formnext 2023:**  
Hall 12.1, Booth D81

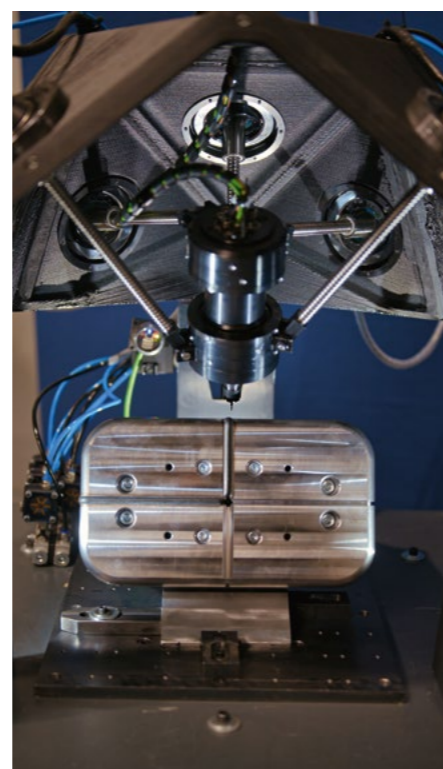
### A MACHINE FRAME STRAIGHT FROM THE PRINTER

**M**etrom has planned a special demonstration for Formnext 2023: A 3D printed metal component will be milled live at the show. This will involve a machine frame for a Metrom Pentapod that was produced using the SEAM (FGF) process.

The main goal of the company's corresponding project was to reduce the weight of a miniature milling machine to 50kg. This would make it possible for two people (each using a 25kg lever load) to position the machine manually in mobile applications. The machine frame manufactured in SEAM (Screw Extrusion Additive Manufacturing) exceeded this goal with a total mass of 45kg. Through additional optimization of the frame's geometry, the working space was simultaneously increased by a factor of 1.5. Production costs were also reduced by 50 percent and the turnaround time for the frame was shortened from 3.5 weeks to just one. Despite a 50-percent reduction in machine weight, the system has comparable rigidity and machine accuracy, as an evaluation of the

machine's calibration indicates. Carbon-fiber-reinforced thermoplastics were processed in the SEAM 3D-printing process to produce the highly rigid and loadable machine frame, and a load-oriented strand orientation was used. Polyamide 6 consisting of 40 percent recycled carbon fibers (Akromid B3 ICF40) was chosen as the material. The machine frame was 3D printed at Fraunhofer IWU on a SEAMHex system, which will also be used at Formnext. The functional surfaces were post-processed on a Pentapod P1410. For Metrom, the next step will involve exploring the possibilities for functional integration of sensor technology into the frame components.

**Metrom at Formnext 2023:**  
Hall 11.0, Booth C29



Images: Photocentric, Metrom, Eplus3D

## EXHIBITOR NEWS

### UP TO 25 LASERS

**E**plus3D is ushering in a new era of 3D Printing (PBF) in large-format metal components: The EP-M1550, which the company says is the largest system of its kind on the market, features an innovative configuration that utilizes a four-by-four matrix of 16 lasers and 16 galvanometers. The lasers can be operated synchronously, ensuring the system's high build rate of up to 650 cm<sup>3</sup>/h. Upon customer request, the optics system can also be configured to include a five-by-five matrix (25 lasers and 25 galvanometers).

With the design of the machine focusing on large-scale production, the build volume of the EP-M1550 is 1558 x 1558 x 1200mm, with the option to extend the height up to a full two meters. This results in an even larger functional printing volume than the base system, which already offers 2,670 liters (including the build plate). The machine comes with either 500W or 700W lasers, enabling it to print a wide range of materials – including titanium alloys, aluminum alloys, stainless steels, and mold steels, to

name a few. This means the EP-M1550 provides the same number of material options as Eplus3D's other, smaller frame systems. The machine can also manufacture at layer thicknesses between 20 and 120µm.

**Eplus3D at Formnext 2023:**  
Hall 12.0, Booth D41

Advertisement for the Apium P400 3D printer. The top part shows a close-up of the printer's nozzle and a glowing orange laser line. The text reads: "Apium P400 Experience a New Level of Additive Manufacturing Next Generation Adaptive Heating". The bottom part shows the full printer with a control panel. Text on the right says: "An Unprecedented Platform for Additive Manufacturing Especially for High End Polymers like PEEK Outstanding Layer Adhesion Powered by Next Generation Adaptive Zone Heating Resulting in Maximized Part Strength and Quality Highest Energy Efficiency and Minimal Infrastructure Requirements Visit the Leaders in High Performance Polymer Printing at Formnext in Hall 12.1 Booth E1C www.apiumtec.com"



## EXHIBITOR NEWS

## AUTOMATING THE 3D PRINTING OF CERAMICS

The era of automating technical ceramic 3D Printing has arrived, at least according to the French company 3DCeram. Once confined to prototyping, 3D Printing is transitioning into a production tool and fundamentally reshaping manufacturing norms. This paradigm shift is positioning 3D Printing as a readily deployable asset within workshops that focus on manufacturing technical ceramic components.

3DCeram is set to unveil this transformative concept at the upcoming Formnext exhibition in Frankfurt. Informed by its extensive interactions with the surrounding industry, 3DCeram's offerings cater to industrial requirements like efficiency, productivity, quality, and adaptability. Automating 3D Printing lines comes with its own set of challenges, however, including in finding reliable technology and scaling printing platforms.

Ceramic 3D Printing is gaining further momentum through stereolithography, which offers large printing zones. Two printers 3DCeram plans to launch at Formnext – the C1000 Flexmatic and C3600 Ultimate – embody this direction. They feature CPS 2.0, 3DCeram's next-generation printing software for its Ceramaker printer line.

3DCeram is also part of the European HyP3D project, which is set to redefine the landscape of hydrogen production. Leveraging cutting-edge 3D Printing techniques, the project aims to prove the viability of a disruptive technology known as solid oxide electrolysis cells (SOEC). The HyP3D project centers on the ambitious goal of delivering an ultra-compact, high-pressure, standalone SOEC stack capable of converting electricity into compressed hydrogen.

3DCeram at Formnext 2023:  
Hall 11.1, Booth C33



## FOR JEWELRY, DENTAL BRACKETS, AUTOMOTIVE KNOBS, AND MORE

Incus, an Austrian 3D-printing manufacturer specializing in lithography-based metal manufacturing (LMM), is introducing the new Hammer Pro40 printing solution to upscale its technology for mass manufacturing.

Building on the principles of the Hammer Lab35 printing system, the Hammer Pro40 represents a significant upgrade in production capability. It offers a larger build volume without any loss in accuracy thanks to its two moving or scrolling projectors (instead of one stationary projector). Boasting a platform six times larger than its predecessor, the Hammer Pro40 enables users to make the leap to mass manufacturing. With a high potential throughput (700cm<sup>3</sup>/hour) and excellent resolution (pixel pitch of 40µm in X/Y), the solution facilitates economical printing while delivering complex geometries and surface aesthetics.

The Hammer Pro40 is engineered to manufacture large batches of intricate, specialty



parts in everything from dental and medical applications to the fields of automotive production, microrobotics, and jewelry. According to Incus, it produces parts with a surface roughness (Ra) of 2µm after sintering. Thanks to their

high green strength, the handling of green parts can easily be automated. The Hammer Pro40 is designed to complete several jobs without the need for operator intervention, and it includes a feedstock supply that lasts for at least two to three days. The job preparation, setup, and material changeover processes have been streamlined to take less than five minutes, which ensures seamless, uninterrupted printing.

»The Hammer Pro40 was strategically developed to fulfill the growing demand for mass manufacturing,« affirms Incus CEO Dr. Gerald Mitteramskogler. »Within a single print run, you can create intricate medical gripping devices, patient-specific dental brackets, personalized jewelry pieces, prototypes for electronic devices, and customized automotive knobs for luxury interior designs.«

Incus at Formnext 2023:  
Hall 11.1, Booth D42

Images: 3DCeram, Incus

## EXHIBITOR NEWS

## MOVING UP TO FIVE TONS OF POWDER

In its AMCM M 8K system, AMCM has announced a large-format metal printer with eight lasers and a build volume of 800 x 800 x 1200mm. The first application will involve printing the combustion chamber of ArianeGroup's Prometheus rocket engine. This chamber will be printed from CuCr1Zr and have a height of over 1,000mm, as well as a maximum diameter of 800mm. »Our new M 8K system will be operational within a year. We've promised ArianeGroup the first printed combustion chambers before the end of 2024,« says Martin Bullemer, managing director at AMCM. »ArianeGroup projects must meet ESA's strict requirements in order to be approved for launch. As a result, part quality is one of our

highest priorities, and that includes properties like material microstructure and surface roughness,« explains Jan Alting, head of future propulsion at ArianeGroup. The build volume of the M 8K is four times that of the M 4K. Therefore, the z-axis of the system has to be able to move up to five tons of powder with the highest precision, explains Bullemer, who also emphasizes the significance of the material feed. »The importance of material supply is often underestimated. In printing parts that are up to 1.2 meters tall with high levels of quality and productivity, powder management is key. Reliably feeding in tons of metal powder over several days is no walk in the park. You don't want to interrupt the process under any circumstances.« In

SmartFusion and EOSTATE Exposure OT (optical tomography), AMCM also plans to integrate the latest technology from the EOS Group into its M 8K system to further improve in-process quality assurance and process monitoring. This in turn will help reduce the subsequent testing effort required.

AMCM at Formnext 2023:  
Hall 11.1, Booth D49

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# Lucrative business opportunities beyond prototypes and components

At Formnext 2023, the Service Provider Marketplace is set to showcase current and future opportunities for providers of AM services.

It's been years since Daimler Truck and Daimler Buses started building up their considerable expertise in 3D Printing. Among other areas, this ongoing effort is meant to take the group's product development and its business in spare parts to another level. Daimler is far from producing all its AM components itself, however. »Right now, we're still getting up to 90 percent of the 3D printed standard components and spare parts we need from service providers that we've certified,« reports Ralf Anderhofstadt, who heads the Center of Competence 3D-Printing and the Additive Manufacturing Solutions consulting unit at Daimler. He has also written two books on the subject of disruptive 3D Printing.

For Daimler Buses, collaborative relationships with its providers of 3D-printing services are important; after all, it's not just about producing parts to certain specifications at the lowest possible price. »Our partners often help us evaluate new technologies or give us advice on specific new developments,« explains Anderhofstadt, who is seeing a continued increase in demand in these fields – which means promising business prospects for service providers in AM. »There's a lot of potential out there, especially in development partnerships,« he affirms. This is because of the AM world's capacity for innovation: With new printing technologies and materi-

als hitting the market seemingly every day, even a corporation like Daimler Truck – which generates more than €50 billion in revenue every year – can't afford to acquire and appraise every new 3D-printing innovation that comes out, as Anderhofstadt points out.

Novanta  
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HALL 12.0 BOOTH E114

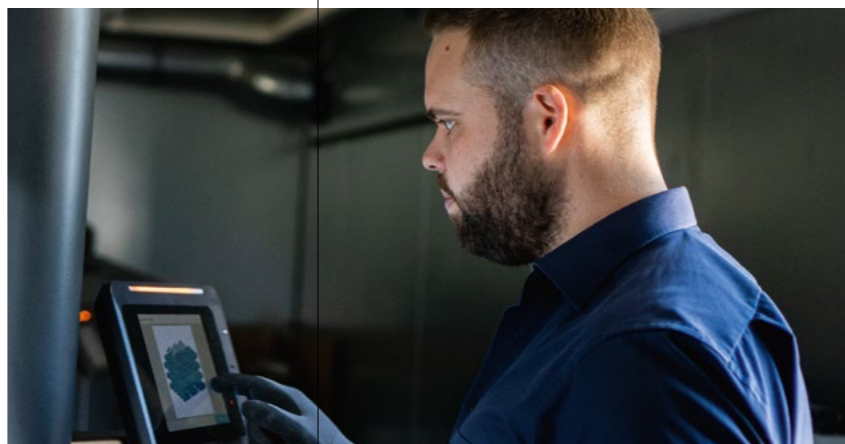
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### TIME FOR SERVICE PROVIDERS TO SHINE

To underscore the importance of service providers along the additive process chain, Formnext is working closely with Daimler Truck and Daimler Buses on the first-ever Service Provider Marketplace. Along with vehicle

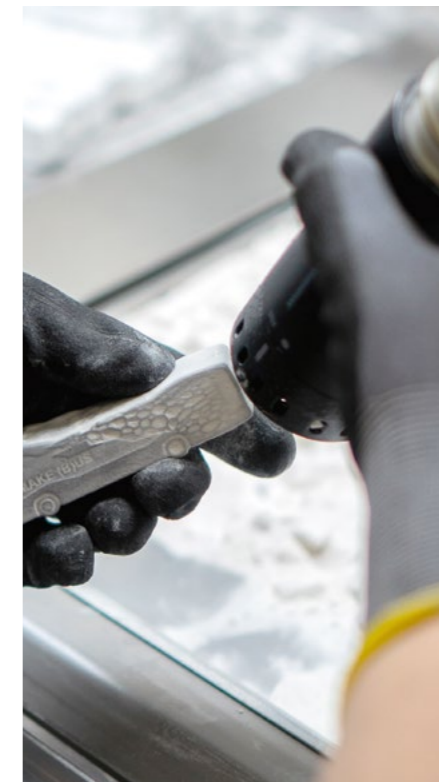
manufacturers themselves, this showcase will present examples of services provided by companies like Brose in the wider automotive sector. An array of applications will be demonstrated using corresponding standard components and spare parts. »Among other things, we want the Service Provider Marketplace to highlight the wide variety of business opportunities AM presents for service providers,« says Sascha F. Wenzler, Vice President of Formnext at Mesago Messe Frankfurt GmbH. At the center of the showcase will be a lounge area that promises to provide just the right setting for service providers, customers, and other potential partners to discuss the possibilities.

In his many years of working with service providers, Anderhofstadt has grown to particularly appreciate their flexibility and open-mindedness when it comes to different technologies. »That's one of the main strengths of these companies: A lot of them have their fingers on the pulse of technological progress even more than we do, and they bring a great deal of experience to the table, as well.« Some could even help connect start-ups from other continents with corporations in the European market – for example, in situations where legal obstacles or other hurdles would make it difficult for them to collaborate. According to Anderhofstadt, AM service providers also typically have flat organizational hierarchies that enable them to take on specific projects and developments on short notice. This often makes them sought-after partners when it comes to moving forward with innovations.



Images: Daimler Truck & Buses

Formnext, Ralf Anderhofstadt, and his colleagues at Daimler all share a common goal: aiding the ongoing advancement of the service sector in Additive Manufacturing. »On the whole, we need even more innovative service providers in Germany and Europe in general,« Anderhofstadt declares, adding that companies in the United States and Asia are much more open to new technologies and more assured in responding to new developments. »That's where we need to keep up.«



Daimler Truck and Daimler Buses procure up to 90 percent of the 3D printed standard components and spare parts they need from service providers

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The Service Provider Marketplace at Formnext 2023: Hall 12.1, Booth B101

PometonPlus is an AM powders line of the Italian company Pometon SpA.

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## EXHIBITOR NEWS

## RESOLUTION DOWN TO TWO MICRONS

At this year's Formnext, Boston Micro Fabrication (BMF) will be presenting its microArch series of 3D printers, which can be used to produce experimental and low-volume parts on a micron scale. The microArch 3D printers support resolutions down to 2µ and a scale fidelity of +/- 10 microns. They are based on a patented process called projection micro stereolithography (PµSL), which combines the advantages of digital light processing (DLP) and stereolithography. A flash of light triggers the rapid photopolymerization of an entire layer of resin, and continuous exposures accelerate the process. BMF offers an open material system for this technology. It includes resins that are rigid, tough, resistant to high temperatures, biocompatible, flexible, or even transparent. In addition to engineering and biomedical plastics, hydrogels and composite resins containing ceramic or metal particles can be used. The microArch 3D printers are divided into three series according to the reso-



lution they can achieve. With a resolution down to 25µm, the S350 model is suitable for micro-scale parts, but also for small parts that require high accuracy and precision. The second series comprises printers with a resolution down to 10µm and a large build volume for industrial applications. This includes the microArch S240,

which has a build area of 100 x 100 x 75mm. The highest resolution (down to 2µm) is offered by printers such as the microArch S230.

**Boston Micro Fabrication at Formnext 2023:**  
Hall 11.1, Booth B38



## NEW PRINTING TECHNOLOGY FOR ADVANCED CERAMICS

D3-AM GmbH will be presenting its new Micro Particle Jetting (MPJ) printing technology for the production of advanced ceramics at Formnext 2023. According to the manufacturer, this goes beyond the limitations of conventional inkjet systems and facilitates direct printing of water-based, highly filled suspensions with virtually any particle size and distribution. After sintering, complex and dense components are created through intelligent droplet generation.

»By removing the limitations of material compatibility, we are enabling the production of components that were previously thought to be infeasible. Our technology has the potential to revolutionize Additive Manufacturing in everything from aerospace to the energy transition,« says Stefan Waldner, chief product officer at D3-AM GmbH.

Along with its new printing system, D3-AM will be showing off parts and components it has already produced from aluminum oxide and pure silicon carbide (SSiC) at this year's Formnext. The company is a corporate startup



of the Durst Group, a global leader in digital printing and production technologies.

**D3-AM at Formnext 2023:**  
Hall 11.1, Booth F38



Images: Boston Micro Fabrication, D3-AM, Venox

## EXHIBITOR NEWS

## LAYING CONTINUOUS FIBERS FREELY IN SPACE

The start-up Venox Systems GmbH will be showcasing the potential of its latest 3D printer, V-REX, at Formnext. With the support of DeepTech funding from Austria Wirtschaftsservice AWS GmbH, Venox has developed a system that enables the production

of all-new types of 3D printed components for a wide range of industrial sectors. The V-REX opens up a new approach to intelligent and multi-functional high-performance composite components.

The innovation of the V-REX lies in the possibility to lay continuous fibers freely in space. Thanks to its five-axis design, the printing direction can be adjusted in all the fiber directions required, enabling a load-path-compliant fiber layout.

Another groundbreaking development of the V-REX system relates to its expanded material set. In addition to the industry-standard continuous fiber materials, optical glass fibers, copper wires, and resistance wires can now be processed seamlessly.

In addition to Venox's specially developed print head technology for processing continuous fibers, other technologies can be used in the same process through a tool-changing mechanism. One example is the processing of thermoplastic plastics using fused filament fabrication (FFF) technology.



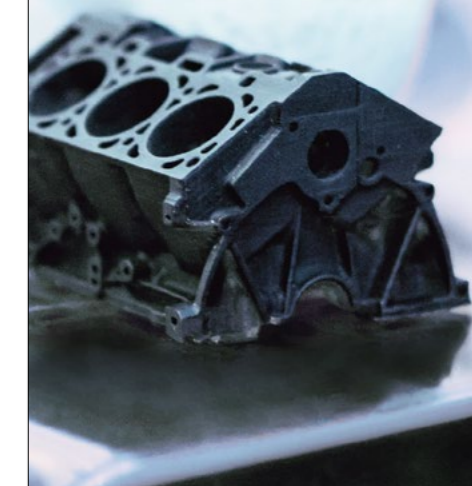
**Venox at Formnext 2023:**  
Hall 11.0, Booth C68

## INNOVATIONS FOR LIQUID METAL PRINTING

Grob-Werke will be presenting new developments for its GMP300 system, a liquid metal printer that was first introduced in 2022, at Formnext 2023. These include further stabilization of the printing process, which has been achieved through targeted enhancements of the installation space and the inert gas concept, as well as monitoring and control. In contrast to the familiar powder bed processes, the liquid metal printing process developed by Grob-Werke uses wire as its starting material.

**Grob-Werke at Formnext 2023:**  
Hall 11.0, Booth C51

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## EXHIBITOR NEWS

## AUTOMATED POWDER COLLECTION STATION

Solukon will be presenting a fully automated powder collection station for the first time at Formnext. The Solukon Powder Collection Unit (SFM-PCU for short) is designed to make the handling of metal powders faster, easier, and safer immediately after de-powdering. With the help of its integrated vacuum conveying system, the SFM-PCU sucks in powder at a sensor-monitored transfer point and gently transports it via a hose into a large container. From there, the contamination-free material can be transferred via a neutral interface to a reprocessing station or similar location and made available for further printing processes. The container can be rolled and changed during the process. The fill level is monitored by sensors and can be checked via large viewing windows. Thanks to a direct digital connection to the Solukon de-dusting system, the user always has a real-time overview of the process status.



In addition, Solukon will be showing off central innovations contained in the SFM-AT350 (see picture) de-dusting system. For example, complex cleaning sequences for the SFM-AT350 no longer have to be programmed, but can be calculated with the SPR-Pathfinder software. Solukon introduced this software just over a year ago, initially for the larger SFM-AT800-S and SFM-AT1000-S systems. Now the company is following suit for the medium-sized segment. Solukon will also be presenting new functions for its sensor and interface kit that make energy consumption and CO<sub>2</sub> emissions measurable in industrial dust collection. Here, the company is already working to fulfill the coming legal requirements for measuring CO<sub>2</sub> emissions in mechanical engineering.

Solukon at Formnext 2023:  
Hall 12.0, Booth D42

## ACCURATE TO 1.9MM FROM A DISTANCE OF 10 METERS

Luxembourg-based Artec 3D is coming to Formnext with its new Artec Ray II scanner and Artec Studio 18 (AS18). The Artec Ray II is a high-precision 3D lidar scanner designed to digitalize large objects and spaces with high speed and accuracy. The scanner

was developed in collaboration with Leica Geosystems, a subsidiary of Hexagon.

The lidar scanner can capture an entire dome in 1.7 minutes, with a 3D point accuracy of 1.9mm from 10 meters away. When paired with the Artec Leo, the Ray II is suitable for creating digital twins of objects such as wind turbines, ship propellers, aircraft, bridges, factory buildings, and even complex forensic scenes and archaeological sites. According to the manufacturer, it offers an angular accuracy of 18" (0.87mm at 10m) and a range accuracy of 1.0mm + 10ppm.

Meanwhile, Artec 3D's AI-powered, metrology-certified Artec Studio 18 3D scanning software is packed with new tools designed to speed up users' 3D scanning workflows. Its new algorithms accelerate quality checks, enable instant identification of defects, and ensure that models are compliant with industry tolerances.



Artec 3D Europe at Formnext 2023:  
Hall 12.1, Booth F59



## EXHIBITOR NEWS

## HARDLY ANY NOISE OR VIBRATION



Designed for applications where low noise and vibration are top priorities, the NMP 820 from KNF Neuberger is a micro diaphragm pump that is exceptionally quiet for its high performance.

The new NMP 820 delivers up to 2.1 liters of free flow per minute, operates at pressures up to 1.3 bar relative, and generates a vacuum down to 300 mbar absolute. Adding a second pump head increases the free flow up to 3.6 liters per minute and allows for an ultimate vacuum down to 100 mbar abs. The pump's optimized design produces exceptionally low noise and vibration, making it extremely



versatile and ideal for a wide range of applications where such qualities are critical (e.g. in purging print heads or creating a meniscus effect in binder jetting systems). For easy and flexible installation, a standard mounting plate is included. A four-wired brushless motor option is also available for PWM pump control.

KNF Neuberger at Formnext 2023:  
Hall 12.0, Booth D68

## UP TO 450°C

At this year's Formnext, the Canadian company Dyze Design is set to debut the Pulsar Atom, a compact precision pellet extruder. Using thermoplastic pellets as its raw material, the Pulsar Atom reaches temperatures up to 450°C, which makes it possible to process high-temperature materials.

In addition, the Pulsar Atom can operate in environments as low as 150°C. With a minimum compression ratio of 1.5, it provides consistent and reliable extrusion for a wide range of thermoplastics while managing material output of approximately 0.8 to 1 kg per hour.

Dyze Design at Formnext 2023:  
Hall 12.1, Booth G81

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## EXHIBITOR NEWS

### NEW LIGHT ENGINES FOR HIGHER THROUGHPUT

Visitech's new NEOS platform has upgraded subsystems that make it easier to build high-volume, high-speed AM machines with field-proven reliability. The platform features the Luxbeam LRS-MCx 4K light engine, which the company says doubles Additive Manufacturing capacity with true 4K resolution and scrolling capabilities. Set to be unveiled at Formnext 2023, the NEOS platform even includes an all-new, cost-efficient, compact projector – the world's smallest WQXGA light engine, but still a powerful one according to Visitech. In the NEOS platform, boosted power output from Gen5 proprietary LED modules is one of the many striking platform-wide upgrades that impact the throughput capabilities of

machines that use Visitech subsystems. Visitech's LRS-MCx 4K projector, for example, brings higher productivity to AM. With native 4K resolution and industrial Ethernet-based data loading and communication, this projector is optimized for stacked and scrolling high-performance machine configurations in 3D Printing that make it possible to scale up the build area. The NEOS platform's light engines have also received robustness upgrades that are designed to meet industry requirements for uninterrupted 24/7 production operations in harsher environments. Advanced liquid cooling for temperature control and clean air filters ensure continuous stable performance with minimal need for maintenance. The full NEOS platform encompasses



seven light engine subsystems with specific features to suit advanced requirements and configurations. With an eye toward the fast pace of the AM market, Visitech will also be showing off other new additions to the NEOS platform at Formnext, including the Luxbeam LRS Compact and Compact Plus.

Visitech at Formnext 2023:  
Hall 11.1, Booth C68

### HIGH PRODUCTIVITY THROUGH IN-FOCUS ZOOM

Raylase is expanding its portfolio of solutions for the AM market and focusing on matched complete solutions, which consist of a beam deflection unit and complementary products for further tasks related to the exposure process. At Formnext 2023, the company will be showcasing its latest laser deflection units and scanning solutions. The AM Module III combines Raylase's experience with previous AM products with its expertise

in the AXIALSCAN FIBER series. The key features of the new pre-focusing deflection unit include high productivity through in-focus zoom, an optical system designed for beam shaping and high laser power, the new Rayvolution Drive dynamic z-axis, and a multi-scan head design. In the Rayspector, Raylase also offers focus tracking that is optimally adapted to the AM Module III. Thanks to highly dynamic lens shifting using Rayvolution Drive

technology, the observation process precisely follows scan movement and produces sharp images of the entire observation field. This makes sophisticated image analysis possible, which in turn enables quality monitoring and even process control.

Raylase at Formnext 2023:  
Hall 12.0, Booth C09

### INDUSTRIAL VACUUMS WITH EXPLOSION PROTECTION

Depureco has developed EcoBull AM and TB AM, special industrial vacuums for Additive Manufacturing. They can also be integrated into PBF 3D printers and are suitable for the efficient extraction of conductive metal powders. The vacuums are driven by ATEX-certified side channel blowers and feature an explosion-proof system. During the extraction process, the metal

powder enters a liquid bath within the container and passes through a submerged nozzle. The filter system, which comprises a metal grid filter and a nylon filter, separates the metal powder from the inert liquid.

Depureco at Formnext 2023  
Hall 11.0, Booth E53



## EXHIBITOR NEWS

### A MULTI-MATERIAL ROCKET NOZZLE WEIGHING THREE TONS

InssTek has succeeded in producing a three-ton rocket nozzle made of multiple materials. The company now plans to show off the nozzle, which it created in collaboration with the Korea Aerospace Research Institute (KARI), at Formnext 2023. The inner cooling channels are made of Al-bronze, a material with high thermal conductivity, and the exterior is made of Inconel 625, which

has excellent strength and heat resistance. InssTek has developed its core technologies for additive metal printing in-house. These include the CVM powder feed system, an optics module, monitoring functions, five-axis CAM software, and a multi-material process. This facilitates continuous production of complex structures with different materials or gradually changing compositions

(as in the case of the rocket nozzle) without having to interrupt the process.

InssTek at Formnext 2023:  
Hall 12.0, Booth E127

### MORE PROCESS RELIABILITY

With MultecPlus, Multec is presenting a new generation of its proven printer control with comprehensive innovations. This innovative control architecture promises a significant increase in printing speed and a considerable improvement in process reliability for the 3D Printing industry. MultecPlus control enables faster and more efficient work through active resonance compensation. This function analyzes the vibration behavior of a machine and adjusts the motor

control to avoid vibration and resonance. According to Multec, this results in significantly higher printing speeds and improved print quality. In addition, MultecPlus offers an integrated filament tracking system that further increases process reliability. Precise measurement and control of filament volume flow ensures consistency and thus high reproducibility. The system detects deviations immediately and reacts to ensure that each print job is optimally executed.

Multec at Formnext 2023:  
Hall 12.1, Booth E119

## ADDITIVE MANUFACTURING TRAINING, SOFTWARE AND CONSULTATION

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- + Over 30 years of experience
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Images: Visitech, Depureco

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## EXHIBITOR NEWS

### VACUUM CONVEYOR FOR ADDITIVE MANUFACTURING

**P**iab is set to introduce the piFLOWam, its first vacuum conveyor that is designed specifically for the Additive Manufacturing process and now available for integration into OEM systems. The piFLOWam is a small vacuum conveyor that incorporates Piab's efficient COAX pump technology and a butterfly valve into a small and compact design. The butterfly valve is not sensitive to pressure fluctuations and is able to keep a mate-

rial batch inside without the pump being mounted. It has a standard TC connection, which makes it simple to integrate for the customer. According to Piab, the unit is simple to use and integrates easily with any type or brand of 3D printer, sieve, hopper, or another intermediate vessel. The product is controlled by pneumatic or electrical control units. The piFLOWam is made of stainless steel and can withstand material tempera-

tures up to 60°C [140°F]. The conveyor unit weighs 15kg [33lbs] and can achieve a maximum feed pressure of 0.7MPa [101.5 psi].

**Piab at Formnext 2023:**  
Hall 12.0, Booth D79

### IMPROVING THE PRODUCTION OF HEARING AID GEOMETRIES

#### MATERIAL

**T**he specialty chemicals company Altana will be showcasing new resin-based Cubic Ink printing materials at Formnext 2023. In addition to improved materials for functional prototyping in the Flexible, Rigid, Tough, Clear and Dental classes, it plans to launch a new Mold product series with two initial materials, Mold 100 VP and Mold 200 VP. These products can be used to produce molds for audiology applications. According to Altana, molds made from these materials facilitate the release of silicone bodies after curing, which makes the production of hearing aid geometries (for example) much easier. In addition, new Cubic Ink High Performance materials will be on display, which the company says offer even better chemical, thermal,

and mechanical resilience. Also planned for Formnext 2023 are materials featuring everything from impact resistance and rigidity to elasticity and tear resistance. One Altana product that will be making its debut is Cubic Ink High Performance 4-2800 VP ESD, a material that prevents electrostatic charging and can therefore be used in sensitive areas such as the manufacture and handling of sensitive electronic components.

Altana will also be flanking its Cubic Ink High Performance product family with all-round materials that promise very good impact and heat resistance. These are all 1K materials that offer an ample time frame in which the resins can be used, as well as flexible handling; after use, the resins can be stored and reused later.

In addition, Cubic Ink is designed in particular for the area of material jetting. Altana sees potential for future applications in this process because it offers very interesting possibilities due to its better multi-material capability compared to resin-based 3D Printing.

**Altana at Formnext 2023:**  
Hall 12.1, Booth F99

### FIVE CRYOGENIC PRODUCTION LINES

**E**bbecke Process Technologies of Frankfurt am Main, Germany, claims to be the biggest producer of specialized powders and granulates anywhere in Europe. It has now built a new center for cryogenic grinding, mixing, and compacting for high-quality, special-purpose 3D printer powders at its site in

Schoeneck. The new center has five cryogenic production lines with a capacity of 8,000 tons per year thanks to milling technology from Gotic. In developing its new E-Power technology, Ebbecke has solved the biggest problem in the production of 3D printer powders by reducing anti-static force during the sieving

and sifting processes. E-Power has thus made it possible to sieve 3D printer powders finely with very small tolerances.

**Ebbecke Process Technologies at Formnext 2023:**  
Hall 12.1, Booth A139

Image: Amsight

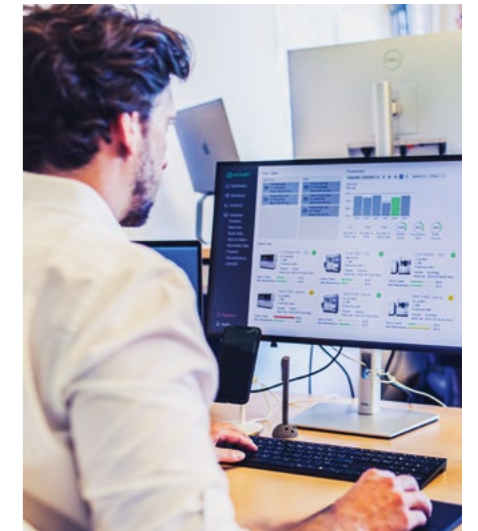
## EXHIBITOR NEWS

### NEW WHITEPAPER ON DATA MANAGEMENT

**A**lthough Additive Manufacturing is generating an enormous amount of data, the full potential of this information remains largely untapped according to the German software company Amsight. The reasons why include the heterogeneity and volume of the data produced in AM, coupled with a lack of standardized data formats and suitable software tools for management and analysis. Recently founded in Hamburg, Germany, as a spin-off of Fraunhofer IAPT, Amsight GmbH's vision is to make data management and analysis in Additive Manufacturing as easy as using a smartphone. Its software automatically collects and stores relevant data on everything from powder to finished parts in a central data-

base. With all this data in the same place, the solution's analytics tool can exploit the valuable insights it contains. The software has already been successfully applied to both production and R&D. To provide a guideline on effective data management, Amsight is set to release a whitepaper on data management in AM at Formnext 2023. Included in the whitepaper is a use case that demonstrates how the German service provider Kegelmann Technik GmbH has optimized the quality and reproducibility of its AM production with the help of Amsight and Fraunhofer IAPT.

**Amsight at Formnext 2023:**  
Hall 12.1, Booth B39B



## Pushing Additive Manufacturing to its limits



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Hall 11.1

\* by courtesy of Launcher  
\*\* by courtesy of CERN, European Organization for Nuclear Research

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## EXHIBITOR NEWS

### FROM THE POND INTO FILAMENT

The Spanish company Smart Materials 3D has developed Smartfil Eco Algae Filament as part of a research project. This PLA material is loaded with spirulina algae, which are microscopic organisms that are used as a nutritional supplement due to their high content of proteins, vitamins, minerals, and antioxidants. They grow in ponds or artificial lakes, where they are nourished by sunlight and residual water.

However, spirulina production generates a significant amount of organic waste that must be properly managed to minimize the environmental impact. The waste contains biomass, nutrients, and carbon that can be used to produce biogas, fertilizers, bioplastics – or filament for 3D printing.

To produce Smartfil Eco Algae Filament, Smart Materials 3D adds spirulina powder to PLA after obtaining it through a drying and milling process. The amount of spirulina can vary depending on the desired properties of the material. The resulting filament has an intense green color and a characteristic smell.

Although there was already a filament on the market with a low percentage of algae, Smart Materials 3D wanted to go a step further and achieve a weight percentage of 15 percent spirulina. This gives the material an organic look with a natural, rustic texture along with the aforementioned color, which does not require the use of pigments.

The algae filament can be used in any 3D printer that uses PLA. It has good adhesive properties between layers according to the



manufacturer, which recommends printing at a temperature between 195 and 215 degrees (C) at a speed between 30 and 50 mm/s with a 1-mm nozzle. Smart Materials 3D adds that the material is biodegradable and avoids plastic waste. Its distinctive appearance can be used to create functional or decorative items, including for interior design, prototyping, toys, jewelry, and other forms of art.

**Smart Materials 3D Printing at Formnext 2023**  
Hall 12.1, Booth G89



### METALS FOR NICHE AM APPLICATIONS

At Formnext 2023, Pometon will be presenting pure metals, particularly those suitable for niche applications in Additive Manufacturing. With its latest VIGA EIGA installations, Pometon is able to produce pure metal powders with very low levels of contam-

inants and interstitials. These spherical powders, which are produced in different particle sizes, can be used in many AM technologies, such as cold or hot spraying and all the layer-by-layer technologies involving both laser and EBM fusion.

**Pometon at Formnext 2023:**  
Hall 11.0, Booth E46

Images: Smart Materials 3D Printing, Xioneer

## EXHIBITOR NEWS

### THREE NEW FFF PRODUCTS

Xioneer is poised to launch soluble support filaments for high-speed printing and a large, modular station for support removal, cleaning, and drying for the FFF 3D printer market.

For example, Xioneer is introducing the new soluble support material VXL 150, which is optimized for printing with high-temperature model materials such as PEKK, PEEK, PC, and Ultem. VXL 150 expands the company's portfolio of soluble support materials, which already consists of VXL 70, VXL 90, VXL 111, and VXL 130. These materials enable complex printing with almost all model materials on all FFF printers.

By rolling out its soluble support materials for high-speed printing, Xioneer aims to overcome previous limitations in this area. Depending on the material combination and printer settings at hand, an interface can be printed at speeds over 300mm/s, which is particularly crucial in light of the growing demand for additive series production of final components as a means of significantly reducing production times.

Meanwhile, the Vortex RCD system is designed for cost-effective post-processing. Thanks to the modularity of the system, the tank volumes are scalable for users of everything from FFF-3D desktop printers to FFF-3D industrial printers with large chamber volumes. The Vortex RCD is a fully automatic system consisting of heatable, modular immersion baths with agitators for aqueous or alkaline solutions that facilitate support removal and subsequent cleaning and drying of 3D printed parts. The immersion baths are available in sizes between 30 and 190 liters and can be combined with one another in the system.

**Xioneer at Formnext 2023:**  
Hall 12.1, Booth E121



## STAINLESS STEEL SOLUTIONS



Powder handling for additive manufacturing.

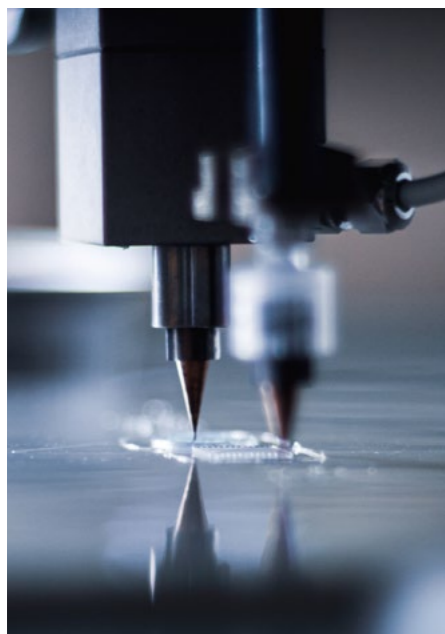
- Mobility
- Handling
- Storage

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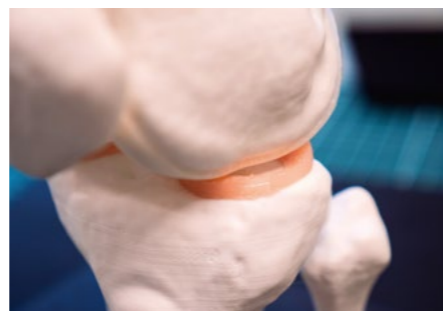
## EXHIBITOR NEWS

### SILICONE PARTS FOR INDUSTRY AND MEDICINE



**A**t Formnext, Elkem Silicones will be showcasing silicone parts printed using its AMSil and AMSil Silibione technologies. This product series enables the production of functional parts from truly 100-percent silicone elastomers using LDM technology. With the AMSil 20000 series, Elkem is targeting industrial applications in areas such as aerospace, automotive, electronics, and appliances. The AMSil Silibione 24000 series, meanwhile, focuses on medical applications. Elkem Silicones aims to improve the quality of life of aging populations. Thanks to its specific formulations, these products can also be used in both food-grade and medical and industrial applications.

Elkem at Formnext 2023:  
Hall 12.1, Booth F91



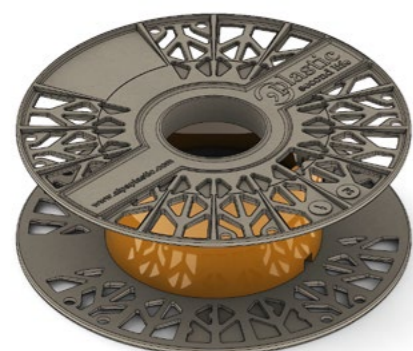
### IMPROVED FILAMENT DEHUMIDIFICATION

Alpaplastic is focusing on developing RS 200 FL, a new, eco-friendly version of its filament spools that combines the strengths of cardboard and plastics to support circular economy. Its removable structure supports recycling and is also more compatible with space requirements in shipping and storage. According to Alpaplastic, the new spool's special design also allows for better dehumidification and is lighter than the previous



RS 200 KD model. In addition, RS 200 FL is available in a Second Life plastic version for that supports reuse and proper disposal.

Alpaplastic at Formnext 2023:  
Hall 12.1, Booth E50



Images: Elkem, Alpaplastic

## EXHIBITOR NEWS

### TAILORED NANOSCALE ALLOYING

**T**he materials science company Forge Nano has announced a new range of innovative Additive Manufacturing techniques using its proprietary Atomic Layer Deposition (ALD) method. This new manufacturing process offers improved flowability of suspensions and transports; increased powder bed volume density; and reduced voids, occlusions, keyholes, porosity, and contaminants in sintering. ALD manufacturing techniques also offer improved optical

absorptivity and oxide dispersion strengthening, a better hygroscopic barrier, tailored nanoscale alloying, and reduced hazardous reactivity, which extends the lifecycle of materials and makes them more sustainable. Improved oxidation resistance ensures the longevity and stability of materials, and the enhanced sintering interface provides for more uniform and consistent surfaces.

Forge Nano at Formnext 2023:  
Hall 11.0, Booth C03

## Let us know what you think!

The Additive Manufacturing industry is always buzzing. With Fon Mag, we want to shed light on AM technologies, solutions and applications in a practical, descriptive and entertaining way. Above all, we want to keep you up to date, even if there is no Formnext at the moment.

### AND THAT'S WHY WE NEED YOU TODAY!

Precisely because of our efforts to produce Fon Mag in the most environmentally friendly way possible (more information on page 35), it would be a pity to print and send out every issue, that doesn't meet all your needs. Please let us know: what you would like to read, what we can do better, what you are missing.

### THANK YOU FOR YOUR EFFORTS!

With every Fon Mag production, we support a selected reforestation project. As a thank-you for your input, you will receive your own small climate protection project or choose which project the next Fon Mag should support. Find out more here: [formnext.com/survey](https://formnext.com/survey)

Thank you for your input!

FonMag

READER SURVEY





# Potential for green applications still underestimated

Additive Manufacturing is already a powerful driver of sustainability in many areas of industry – from aircraft assembly to energy and building construction. However, experts say that the green potential of industrial 3D Printing is still vastly underestimated. To help change that, Formnext will be putting even more of a spotlight on sustainability this year.

One of the most well-known 3D printed components anywhere is surely the fuel nozzle General Electric produces for use in aircraft construction. Besides being a masterpiece in technical terms, this part also shows how innovative AM technology can impact the economy and the broader effort to achieve sustainability. GE Aviation builds the fuel nozzles into its LEAP turbofan engines, where they have helped save thousands of tons of CO<sub>2</sub>.

These days, more and more companies, managers, and politicians are recognizing the potential AM presents in connection with sustainability. Along with more economical jet engines and lighter-weight components for airplanes, it opens the door to more efficient power plant generators, customized heat exchangers, various motors and pumps, and many other types of power units. »Additive Manufacturing is technology that makes sustainable products possible,« says Matthias Schmidt-Lehr from Ampower, a Hamburg-based consulting firm that specializes in AM. »We're far from exhausting its potential in that regard, however; in a lot of areas, we've only just begun and can expect a lot more applications in the coming years.«

## AM AT SIEMENS: CO<sub>2</sub> FOOTPRINTS FOR 3D PRINTED COMPONENTS

The sustainable developments facilitated by AM can play a key role for both nations and corporations like Volkswagen, Siemens, and General Electric as they work toward their carbon reduction targets. Siemens, for instance, has already been utilizing AM for years and now operates an expansive AM competence center in Erlangen. The facility evaluates and presents various additive methods, including in combination with components and software made by the long-standing German giant. »AM enables us to work more efficiently in many areas of our group, which ultimately reduces our carbon emissions, as well,« reports Dr. Karsten Heuser, vice president of Additive Manufacturing at Siemens Digital Industries. »In the process, it's also important to make these achievements measurable. Using our software tools, our experts can calculate the carbon footprint of a given component and figure out whether it should be 3D printed.«

In Finspang (Sweden), meanwhile, the former subsidiary Siemens Energy has established one of Europe's largest 3D metal printing locations, where it has been printing burners for Siemens' gas turbines for many years. Unlike in conventional manufacturing, where they once had to be assembled from 13 different parts, these burners are printed in a single piece. Their optimized design enables them to operate more efficiently, which Siemens says can reduce the carbon emissions of an overall turbine installation by 7,000 tons.

For another example, Dr. Heuser points to a 3D printed robotic gripping arm. By enhancing the design's topology, AM has reduced the arm's weight by 64 percent and its carbon footprint by a full 82 percent. Dr. Heuser believes Additive Manufacturing has tremendous potential to enable future advancements



Above: Siemens began 3D-printing gas turbine burners back in 2017. This one was made for the SGT-700 turbine at E.ON's combined-cycle power plant in Philippsthal, Germany

in sustainability in the area of robotics alone. »Many of the around three billion robots in use around the world can already be outfitted with 3D printed grippers,« he points out. »That would not only save plenty of CO<sub>2</sub>, but improve the robots' performance, as well.« As an added bonus in this use case, an optimized robot requires 54 percent less energy and takes up half the usual space.

Images: Siemens (2), Ampower (1)

## ONE TYPE OF BRACKET – 43 FEWER TONS OF CO<sub>2</sub>

Aircraft construction is generally a key area of application for AM. After all, it's a field where the technology can leverage one of its greatest strengths: Its ability to optimize topology makes it possible to realize things like bionic designs that recall human bone structures. These designs, which can typically only be 3D printed (and not machined, for instance), are both extremely sturdy and extremely light. The resulting weight reductions are enabling the engineers at Airbus, Boeing, and other manufacturers to make airplanes lighter, which can ultimately reduce fuel consumption to a considerable degree.

Every kilogram saves around €2,000 (or 2,000 liters of kerosene) per year – and with the price of CO<sub>2</sub> certificates set to continue rising, those savings are sure to increase, as well. Over the 30–40 years of an aircraft's useful life, every kilogram less can also conserve some 100,000 liters of kerosene.

Another good example of AM's considerable potential when it comes to sustainability involves the brackets that can be found in large numbers in airplanes. In a recent study, Ampower calculated the carbon footprint of the corresponding manufacturing process and found that AM produces less greenhouse gas than the conventional method (eight kilograms of CO<sub>2</sub> instead of 10). However, the real potential for savings is only revealed by the brackets' performance in use: Thanks to their reduced weight, they help reduce carbon emissions by more than 43 tons compared to brackets of conventional design and manufacture.



Above: Thanks to their reduced weight, 3D printed brackets can lower an aircraft's carbon emissions by more than 43 tons compared to conventionally produced (and designed) parts  
Below: Designs with optimized topology can also make significant weight reductions possible in 3D printed robotic grippers. This ultimately makes robots more efficient, as well



## KEY TO CARBON FOOTPRINTS: A SUSTAINABLE ENERGY MIX

»3D Printing requires significantly less energy compared to other production methods, especially when you're working with titanium,« reports Matthias Schmidt-Lehr, whose company has developed a carbon footprint calculator for AM components that factors in everything from material production and actual manufacture to recycling. The tool shows that individual details play a significant role in the production process – take the origin of the powder used, for instance: »Depending on the regional energy mix in question, powder production in countries like China can entail much higher carbon emissions than when renewable energy sources are used, as some plants in Europe are currently doing,« Schmidt-Lehr continues.

The main potential here lies in the possible applications, however, which are incredibly diverse. In many cases, small components of an intelligent design can enhance entire systems. Searching for them is something like looking for the Holy Grail of engineering. That said, it doesn't always have to be a game-changer;

minor improvements often have a major impact, as well. »Up to 80 percent of a product's impact on the environment is determined by its design,« Dr. Heuser explains. This is another area where AM can be a huge help, as it takes product development to a whole new level. »It's a catalyst for rapid iteration, which means products can take on sustainable qualities that wouldn't be possible otherwise,« Dr. Heuser adds. The possibilities afforded by Additive Manufacturing are much more wide-ranging than that, however. For example, parts can be repaired instead of having to be replaced. And let's not forget another of AM's main strengths: decentralized production. This means instead of being made in China as they so often are today, things like eyeglasses can be manufactured regionally and shipped across much shorter distances. Major automotive manufacturers like Daimler are among the many different companies that want to take advantage of this in supplying spare parts.

## »POTENTIAL STILL NOT SUFFICIENTLY RECOGNIZED«

»When it's applied across a range of areas, AM has the capacity to make manufacturing more sustainable,« Dr. Heuser explains. »As of today, however, the potential of this technology hasn't been sufficiently recognized; policymakers in Germany haven't paid much attention to it.« In contrast, Additive Manufacturing can be found in the national growth strategies of the United States and China. »Incorporating an AM strategy into Germany's own national plan for growth could be a significant boon to German industry,« Dr. Heuser suggests.

Meanwhile, Formnext will be focusing even more on the topic of sustainability this year. Not only will numerous exhibitors be showing off their solutions for reducing carbon emissions; the event's surrounding program and conferences will highlight current and upcoming solutions that make industrial 3D Printing possible, along with everything from vertical wind turbines and bio-inclusive cities to more sustainable shoe production.

Siemens at Formnext 2023:  
Hall 12.1, Booth D119  
Ampower at Formnext 2023:  
Hall 12.0, Booth B99

## + FURTHER INFORMATION:

» [siemens.com](https://www.siemens.com)  
» [ampower.eu](https://www.ampower.eu)



## EXHIBITOR NEWS

### EXAMINING RAW MATERIALS OF THE UNPLEASANT KIND

Some raw materials, especially in battery production or Additive Manufacturing, have toxic, carcinogenic, or other harmful properties and must be handled with appropriate care. To make it possible to examine these raw materials safely, AZO has set up the AZO Toxicontainer, a special test room for hazardous substances that complements its laboratory for raw material analysis. In this test environment, appropriate personal protective equipment, gloveboxes, a special air filter system, and room conditioning ensure the best possible setting for working with dangerous raw materials. The Toxicontainer enables AZO to offer smaller conveying tests measuring up

to 10m, raw material parameter analysis (bulk density, moisture determination, or particle size distribution up to 45µm), and the integration of individual plant components.

**AZO at Formnext 2023:**  
Hall 12.0, Booth E98



### AUTOMATED 3D FILAMENT WINDER

Feelo is meeting the growing demand for automation in Additive Manufacturing with its new, fully automated winding system, which will be unveiled for the first time at Formnext. The newly patented Feelo Prima system features a fully automated doffing system and can be installed directly after an

extruder or unwinder to ensure a compact footprint. Feelo also offers a buffer for up to 100 spools that can be automatically transported into the Feelo machine for winding. The line can also be supplemented with robotic arms or other equipment, such as for individual coil labeling, individual coil engraving, or film wrapping.

**Feelo – Fast Assembler at Formnext 2023:**  
Hall 12.1, Booth E48

### NEW SLICING SOFTWARE AND OVEN

With its new IntamSuiteM Neo slicing software for 3D Printing and the new IntamTM oven, Intamsys aims to further enhance the user experience and provide a comprehensive 3D Printing solution. IntamSuiteM Neo is an integrated platform that covers everything from process preparation to monitoring and is compatible with all Intamsys printers. It offers numerous new features, including the ability to work on multiple projects and designs simultaneously. It also makes it possible to view and analyze multiple

3D-printing designs at the same time, which streamlines the design and evaluation process. With adaptive support blockers and support material recommendations, the software ensures much more efficient print preparation, as well. The software will be unveiled to the public for the first time at Formnext 2023. Meanwhile, the IntamTM oven represents the company's aim to improve the success rate and surface quality of printed parts. The oven will be available in three different sizes, with the inner chambers and coil capacities varying

accordingly. The oven is suitable for filament drying or annealing treatment, among other applications. The chamber also has a special air channel structure that ensures a uniform and stable temperature is maintained throughout the interior. In addition, IntamTM's integrated PID control provides automatic temperature management, timer control, and an overtemperature alarm.

**Intamsys Technology at Formnext 2023:**  
Hall 11.1, Booth B31

### SOFTWARE

Images: AZO, Mesago

## FORMNEXT NEWS

### FORMNEXT STREAM – THE DIGITAL EXTENSION

Formnext streAM is our digital offer for online networking, matchmaking and streaming. The platform enables participants (also online only and without ticket) across the globe to screen the product innovations of all exhibitors, initiate contacts and set up appointments for the show or online. You also have the opportunity to continue this exchange digitally following the on-site event. Above all, Formnext streAM offers you the possibility to follow the stage program with Formnext.TV live and on demand.



#### JOIN US DIGITALLY

from 16 October for matchmaking & research  
from 7 November from 10:00 a.m. for live streaming

until 30 November you can catch up on everything you missed

+ FURTHER INFORMATION:  
» [formnext.com/stream](https://formnext.com/stream)

### CHECK OUT FORMNEXT'S CAREER SERVICES – AND HELP SHAPE THE FUTURE OF AM

The boom in Additive Manufacturing continues unabated. Having become serious employers in their own right, start-ups in the field continue to take over the market with their fresh ideas, while more established companies are in the process of reinventing themselves. Are you thinking of getting a foot in the door in this vibrant industry and shaping the future of AM? Or are you already working in the sector and looking to experience something new?

Career day at a glance:

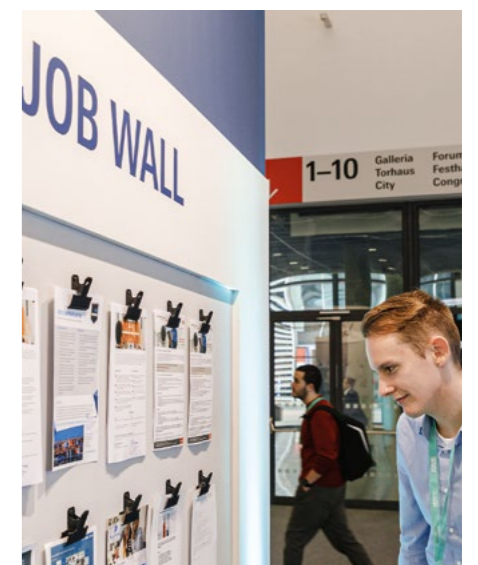
- » Attractive employers presenting potential openings at their companies
- » Free career counseling from 10:00 am to 4:00 pm
- » Free headshot photography from 10:00 am to 4:00 pm
- » Opportunities to talk with potential new employers at Formnext
- » Job postings on the Formnext Job Wall (Career Area) throughout the event

#### CAREER DAY AT FORMNEXT

On 9 November, Formnext Career Day (Career Area, Hall 11.0-D71) will offer the right insights no matter whether you're just getting started in AM or are already a manager or expert in the field.

#### AM JOBS – OUR NEW JOB PORTAL FOR THE AM COMMUNITY

To help you map out your professional future and give you the best possible overview of the job openings at our exhibiting companies, we'll also be offering you access to the new online job platform AM Jobs both prior to Formnext and throughout the year. You can already start looking for your dream job today and then meet your potential new employer in person at this year's Formnext!



To check out all our Career Day offerings and the link to AM Jobs, please visit: [formnext.com/career](https://formnext.com/career)



## EXHIBITOR NEWS

### AUTOMATING BLASTING SURFACE TREATMENT

The final step in a manufacturing process often determines whether a component meets all the relevant requirements in terms of its quality and function. Blasting technology opens up a wide range of ways to influence optical and physical surface properties. For this purpose, BMF GmbH is presenting its new Smart Surface Control (SSC) technology, which makes it possible to integrate blasting surface treatment into automated manufacturing processes for the first time. In close cooperation with renowned universities and manufacturers of measuring equipment,

BMF has also developed a standardized measuring method that provides uniform measurements from which manufacturing parameters can be derived. Subjective attributes such as »beautiful«, »fine«, or »matte« are thus no longer necessary. Meanwhile, direct feedback to the blasting or printing system at hand facilitates a self-contained, controlled, and self-optimizing process. This in turn makes it possible to optimize previous process-related fluctuations in quality. In addition, BMF GmbH says its technology reduces energy and personnel costs by 90 percent.



BMF at Formnext 2023:  
Hall 11.0, Booth B28

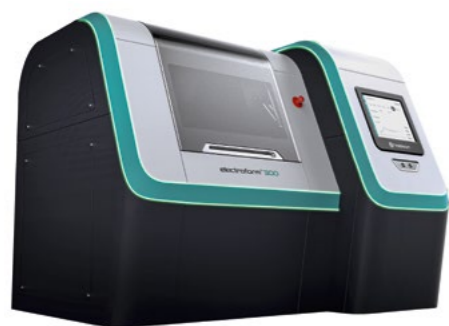
### LASER ENGRAVING AND CUTTING

Snapmaker is bringing its new Snapmaker Ray laser engraving and cutting machine to Formnext. At the heart of the Snapmaker Ray is exceptional laser technology rated at 20W or 40W. Its laser beam combination technology is suitable for engraving and cutting a wide range of materials, including wood, leather,

and metal. Designed for home and small business use, the Ray has a 400 x 600mm engraving area that can be used to create projects such as 3D maps or furniture models. A constant airflow on the work surface ensures clean and precise cuts and reduces the risk of burns.

Shenzhen Snapmaker Technologies at  
Formnext 2023: Hall 12.1, Booth G11

### A FAST WAY TO REDUCE ROUGHNESS



Holdson, a supplier of electrochemical polishing machines, is set to present its Electroform machine at Formnext 2023. With the power of a one-of-a-kind dynamic contour electrode and machine-learning algorithms, the young British company promises that Electroform technology offers »optimal polishing for additively manufactured components.« According to Holdson, the patented machine boasts the ability to reduce surface roughness on metal components by more than 90% in less than five minutes, which makes it possible to control material removal rates. Keeping sustainability in mind, the company uses recyclable

consumables and electrolytes with its Electroform machines in a closed-loop system that eliminates hazardous waste. The machines have been developed with the medical, automotive, aerospace, and nuclear energy industries in mind. Holdson is a West Yorkshire-based supplier of machine tools for electrochemical polishing that aims to address the issue of inconsistent surface finishes on additively manufactured components. The company was founded in 2023 by a team of engineers and entrepreneurs.

Holdson at Formnext 2023:  
Hall 11.0, Booth F30

Images: BMF, Holdson

#### SUSTAINABLE READING FOR A SUSTAINABLE FUTURE

Print can inform, advertise and be green: Formnext Magazine does not generate any e-smog. Print is also perfect for slowing the pace and digitally detoxing. Printed medium still has a lot going for it.

In order to live up to our responsibility for the future, we examine the current possibilities for each issue and do everything we can to produce the Fon Mag in the most environmentally friendly way possible:

- We use paper from sustainable forests.
- We do not use environmentally harmful processing to optimize the printing result.
- The Fon Mag is sent climate-neutrally to the readers.
- With each production run, we support a selected reforestation project to preserve the analog, environmentally friendly reading experience.

Our partners for an environmentally friendly Fon Mag are listed below in the imprint.

Detailed information on our sustainability strategy at [formnext.com/sustainability](https://formnext.com/sustainability).

#### + formnext

» 7 – 10 November 2023  
» Messe Frankfurt, hall 11, 12 and Portalhaus

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» [formnext.com/fonmag](https://formnext.com/fonmag)

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» More information: [formnext.com](https://formnext.com)

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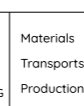
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## EXHIBITOR NEWS

### SMOOTHING AND FINISHING IN ONE STEP

**L**uxYours will be presenting the new Lux Pro 400, an automated system for smoothing and finishing plastic parts, at Formnext 2023. With a process chamber of 300 x 300 x 400mm and the footprint of a Euro pallet, this will be the company's first system that, according to managing director Florian Pfefferkorn, sets new standards worldwide in terms of »quality, cost-effectiveness, flexibility, and sustainability.« As a long-standing service provider in smoothing AM components, LuxYours has developed and gradually refined its Multi Purpose Smoothing (MPS) technique, which can now finish thermoplastic components from different AM processes (such as SLS, MJF, HSS/SAF, and FDM) and

make their porous surfaces water- and gas-tight. The company says that this optimizes the compatibility of products with prolonged skin contact and minimizes attack surfaces for germs and bacteria. The insides of conduit channels can also be smoothed, sealed, and improved in terms of flow. According to LuxYours, the secret of MPS lies in an in-depth understanding of the physical-chemical processes involved and how they interact. Components refined using this technique retain their REACH compliance and are food-contact-compliant according to EU 10/2011. The operating fluids used are biologically harmless and can be recovered at lukewarm temperatures within the system.



LuxYours at Formnext 2023:  
Hall 11.1, Booth B48

### RENOWNED CUSTOMERS FOR AWARD-WINNING START-UP



**A**fter winning the Formnext Start-up Challenge in 2022, Rivelin Robotics will be back in Frankfurt in November with exciting collaborations to talk about: GKN Aerospace and Wall Colmonoy have invested in NetShape, its post-processing solution for metal AM. At Formnext 2023, Rivelin will be showcasing its NetShape robots, which pro-

vide an automated solution for metal carrier removal and targeted post-processing. The NetShape control software, meanwhile, optimizes quality and repeatability in support removal and finishing.

Rivelin at Formnext 2023:  
Hall 12.0, Booth E41

### PRECISE METAL STRESS-STRAIN CURVES

**P**lastometrex, a provider of mechanical testing technology, is introducing an easy-to-install attachment for its novel Benchtop Plastometer. The new module facilitates fast, affordable, and fully automated high-temperature testing of metallic materials by delivering precise stress-strain curves for metals tested at up to 800°C. Set to launch in Q4 of 2023, the high-temperature module easily integrates with the company's existing

Benchtop Plastometer, making the module easy to swap in and out. This modularity also extends to the software used to power the tool, as the attachment is controlled by the same Corsica software used by the Plastometer. The PLX Benchtop Plastometer boasts rapid heating and cooling, reaching 800°C in approximately 15 minutes and cooling down just as quickly, which enables swift testing of multiple samples. Testing takes about five

minutes, meaning the entire process can be finished in under an hour for extreme temperatures.

Plastometrex at Formnext 2023:  
Hall 11.0, Booth C74

Images: LuxYours, Rivelin, Aimplas

## EXHIBITOR NEWS

### MEDICAL TECHNOLOGY, LIGHTWEIGHT CONSTRUCTION, AND SPACE TRAVEL

**B**erlin has set itself the goal of becoming the 3D Printing capital of Europe by 2030. The Berlin Senate is currently investing more than €13 million in 12 cutting-edge projects that deal specifically with Additive Manufacturing. These funds are flowing into research and development projects in medical technology, lightweight construction, and aerospace. A key driver of this development is the 3D Printing initiative Additive Manufacturing Berlin Brandenburg (AMBER), which is being coordinated by Berlin Partner.

PerKunSt, for example – a project by Fraunhofer IPK in cooperation with InnoRa GmbH and Organical Cad/Cam GmbH – aims to develop personalized, biodegradable plastic stents. Also from the field of medical technology comes ProAstraDental, a joint project of

the company Trinkle, the Berlin university hospital Charité, and TU Berlin, which is developing new types of dental prosthetic implants to be manufactured in a highly automated production chain. Meanwhile, the Federal Institute for Materials Research and Testing (BAM) is working with TU Berlin and Xerion on MikroG, a compact and fully automated system featuring filament extrusion technology. The aim here is to enable the Additive Manufacturing of metallic and ceramic components in a flexible, decentralized, and mobile way.

Another focus is lightweight construction. In the AddGleis project, for instance, the companies FKS Maschinenbau and Photon, together with the Berlin University of Applied Sciences (BHT) and TU Berlin, are developing additively

manufactured lightweight stiffening structures for use in rail vehicles.

The business development agency Berlin Partner für Wirtschaft und Technologie is Berlin's service provider for growth and innovation. It supports companies and investors in establishing locations and developing in Berlin.

Berlin Partner für Wirtschaft und Technologie  
at Formnext 2023: Hall 11.1, Booth D31 & D39

### ELECTRICAL OR MAGNETIC CONDUCTIVITY



**T**he plastics technology center Aimplas is working on developing new flexible smart materials with electrical or magnetic conductivity properties that support integration into both soft robotics and electronic sensors. Its products FILL 1 and 2, for example, are flexible high-conductivity filaments that enable the development of finished electrical products and 3D printed flexible electronics. Aimplas offers global solutions for the entire value chain in research, development, and innovation and technological services in the plastics sector, specifically in developing new materials. One of its areas of focus involves studying materials with unique characteristics in connection with Additive Manufacturing, be it in material synthesis, compounding, filament extrusion, or pelletizing – including with a focus on sustainability and health.

Aimplas at Formnext 2023:  
Hall 12.0, Booth B119



## EXHIBITOR NEWS

## 3D-PRINTING SILVER

925 sterling silver, which has made a name for itself in jewelry, is much more than just a decorative material. Its electrical conductivity and versatility in various applications, from musical instruments to electrical engineering, make it a sought-after raw material. Now, CADdent GmbH has announced its ability to 3D-print silver, which it will also showcase at Formnext. The company already demonstrated how to melt gold with lasers in 2019, which caused a stir, especially in the field of dental technology. CADdent also sees the 3D-printing of silver as offering »endless possibilities for customized solutions in a world that constantly craves individuality.«

CADdent at Formnext 2023:  
Hall 12.1, Booth E79



## MATERIALS AND A TECHNOLOGY PORTFOLIO UNDER ONE ROOF

VMR GmbH & Co. KG has been operating under the name Henngineered since July 2023. Since then, the three subsidiaries (VMR, TKW, and UFT) of the Henn Connector Group have been offering a broader material and technology portfolio, as well as more comprehensive industrialization support, under one roof. The Henngineered umbrella now covers

plastic injection molding, turning and milling, metal deep drawing, metal and plastic 3D Printing, and vacuum and polyamide casting. In addition, the company offers services along the entire process chain and has extensive expertise in automation. The Austria-based Henn Connector Group generated nearly €140 million in sales in 2022 and has 550 employees worldwide.

Henn Industrial Group at Formnext 2023:  
Hall 11.0, Booth F22

## DETERMINING THE CARBON FOOTPRINT OF PRINTED POLYMER COMPONENTS

Ampower first presented its Sustainability Calculator Metal at Formnext 2022. Since then, more than 100 companies have already used this innovative calculation tool and the data and calculation algorithms developed by Ampower to independently determine and document the carbon footprint of their metal additive components. At Formnext 2023, a polymer variant will be added to the tool for the first time. According to Ampower, this will be the first manufacturer-independent solution for

determining the carbon footprint of 3D printed polymer components. The new polymer calculator covers a wide range of technologies and materials, including PA12, PA11, PP, and TPU in common powder bed processes. In addition, it provides data for resin-based processes such as DLP and commonly used extrusion techniques (also known as FFF or FDM) in key materials. Meanwhile, the tool enables not only the calculation of carbon footprints along the entire value chain, but also comparisons with conventional

manufacturing methods. For large companies that are already using LCA analysis tools, the tool provides an independent data foundation for mapping AM processes in existing LCA software solutions.

Ampower at Formnext 2023:  
Hall 12.0, Booth B99

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