

Expo edition 2019

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formnext magazine

A THRILLING SUCCESS STORY

Since being given the opportunity to organize Formnext – the leading exhibition in the global additive manufacturing industry – we’ve witnessed just how dynamic industrial applications in AM can be, particularly in light of the strong growth in materials and pre- and post-processing in the last two years. You might say AM is »growing up«, or perhaps growing into its role in modern production. This bears out Formnext’s process-oriented approach, its inclusive stance with regard to materials, and its ability to offer an excellent overview of the developments in the market.

After making our debut with 203 exhibitors, just under 9,000 attendees, and 14,000 square meters of space in 2015, the fifth edition of the Formnext exhibition is set to welcome more than 800 exhibitors to a facility spanning over 50,000 square meters. Nearly 27,000 visitors flocked to Frankfurt am Main in 2018, and we expect that number to rise once again this year – with over half of our exhibitors and attendees coming from outside of Germany. All this makes for a thrilling success story that we’ve written along with our industry partners, council of exhibitors, and content partner (TCT), as well as with the working group AM within VDMA e.V. (our honorary sponsor) and many other institutions, media members, and supporters.

Right now, the worldwide increase in AM applications in the aerospace, automotive, medical technology, dental, and mechanical engineering sectors – along with new areas such as the offshore, architecture and const-

ruktion industries – is taking place in three main regions: the United States, China, and Europe (where Germany is playing a leading role). Post-processing in particular is presenting new opportunities for manufacturers in fields like finishing, surface technologies, and automation; these players are now bringing products and services to market that need not be limited to 3D printers. As a result, Formnext is also evolving into more and more of a showcase of solutions where users who are looking for answers to their production needs can find precisely that.

Marking another first this year, Formnext has teamed up with a partner country. We’ve naturally chosen one of the world’s most important AM regions in terms of both manufacturers and user industries – the United States! For the first time, we’ll have a U.S. pavilion featuring presentations and events, a panel discussion on Formnext.TV, the second-ever standards forum, and further highlights made

possible by our cooperation with the U.S. Commercial Service and prominent U.S. industry associations (including AMUG, AMT, and ASME).

The pace of innovation in our sector remains high, and many countries are making strategic moves in connection with AM. We’re also seeing targeted acquisitions and investors who are taking a greater interest in the AM market. The in-depth ongoing dialog between users and manufacturers – including outside of Formnext – is giving rise to new ideas and possibilities to discover and help develop additive manufacturing as a life-changing technology. This in turn provides for a constantly shifting marketplace that leaves the industry and event organizers like us no time to rest on our laurels.

We’re very glad to be part of the AM community and its shared journey into the future of innovative production.



Sincerely, Sascha F. Wenzler
Vice President Formnext



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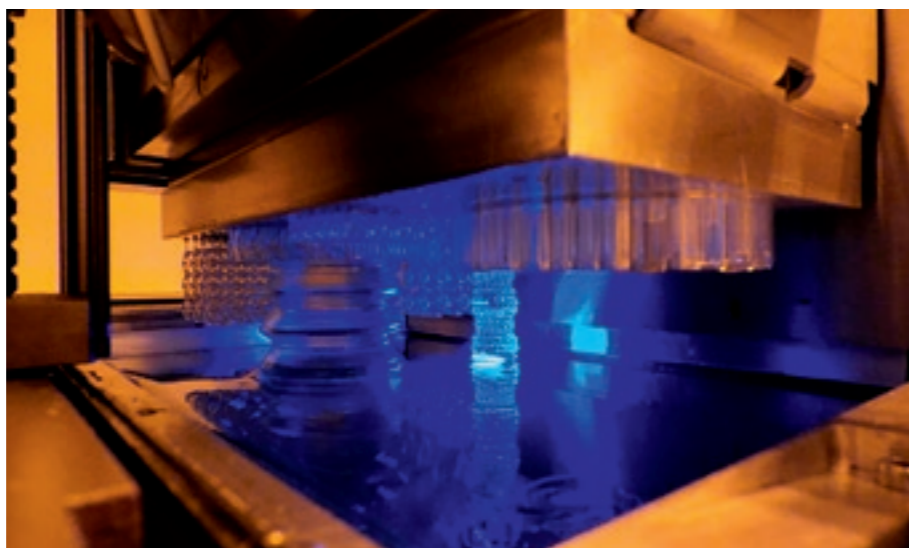
PROCESSING VISCOUS MATERIALS

In additive manufacturing, the right combination of component precision and material characteristics is the key to technical industrial use. To expand the process window in chemical terms, Cubicure has come up with new processing solutions. A patented new procedure it calls »hot lithography« is capable of shaping basic materials that are highly viscous or otherwise difficult to process into three-dimensional objects under controlled conditions.

In developing this technique, Cubicure drew on known concepts in laser stereolithography and combined them with innovative heating and coating processes. With precision laser-scanner systems, object details are possible down to two hundredths of a millimeter and surface finishes similar to those produced in injection molding can be achieved.

One of the main advantages of hot lithography lies in its ability to process viscous materials in a stable manner. Using filler materials, additional properties can be added to plastics, which makes it possible to process non-flammable or self-extinguishing substances. Cubicure has also just announced Evolution FR, its first success in developing a UL94-V0-certified (read: highly non-flammable) plastic.

As part of its aim to offer further innovative materials for use in hot lithography, the company recently announced its new partnership with Evonik, as well. In specific terms, the two organizations will be collaborating strategically on R&D with an eye toward developing single-component (1K) resin systems on the basis of polyester. They plan to present their initial results at Formnext this year.



Visit Cubicure at Formnext 2019:
Hall 11.1, D48

RESEARCH RESULTS FOR WAAM



Addilan has released research results that demonstrate the stability of its Wire Arc Additive Manufacturing Process (WAAM) for metals including titanium, steel alloys, nickel superalloys, invar and aluminum. Validated by laboratory results from Tecnelia, WAAM manufacturing stability guarantees mechanical properties for high deposition additive processes used by demanding industries including aerospace, oil & gas, naval and railway.

»We can now customize additive manufacturing solutions and build components using different materials, on the same machine, while ensuring the stability and integrity of each part,« said Amagoia Paskual, CEO, Addilan.

A specialist in wire arc additive manufacturing, Addilan can apply different electric arc welding technologies, as an energy source to

wire feedstock to produce fully dense metal parts. Addilan announced the first commercial WAAM plasma technology machine at Formnext 2018. This machine was designed to meet high demands from the aerospace industry for titanium parts, featuring a WAAM Plasma Torch and an Inert Chamber.

Visit Addilan at Formnext 2019:
Hall 12.0, B82

Photos: Cubicure, Addilan

BEI LIN

PLACE TO BE FOR ADDITIVE MANUFACTURING

The German capital is now one of the most attractive places for the development of additive manufacturing technologies.

Additive manufacturing processes form a decisive interface between the digital economy and the manufacturing industry. Considering this aspect, it is particularly noteworthy that the entire value-added chain of additive manufacturing is already covered by numerous companies and scientific institutions in Berlin. The dynamic startup scene is another important factor for the rapid development of additive manufacturing technologies in the capital.

Berlin's outstanding scientific landscape makes important contributions to technology development. Among others, its primary focuses are in digital 3D modeling at the Technische Universität of Berlin, printable ceramics, biomaterials, and quality control at the Bundesanstalt für Materialforschung und -prüfung (BAM), and printed electronics at the Fraunhofer IPK and the Beuth University of Applied Sciences.

The Industrial Additive Manufacturing Hub Berlin (IAM Hub) will bring together industrial companies, startups and research institutions at the newly created Marienpark site to exchange know-how in additive manufacturing and develop joint projects.

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PRECISION IN THE MICROMETER RANGE

With the second generation of the CeraFab system family, Lithoz paves the way for the industrial series production of additive high-performance ceramics. At Formnext 2019, the Austrian company will present the S230, S65 and S25 3D printers. These differ in terms of the build platform and with different resolutions depending on the need of the application.

With build speeds of up to 150 slices per hour, productivity is therefore increased four-

fold, Lithoz reports. The current generation of projectors with WQXGA resolution (2560 x 1600 pixels) - in combination with a lens specially developed for the process - provides precision in the micrometer range. The modular design of the CeraFab System also allows for the combination (cascading) of up to 4 production units, creating a scalable and flexible production environment.

The central element of the CeraFab System

is a database for storing and handling process data, facilitating end to end documentation of print jobs and traceability during production. According to Lithoz, the CeraFab System 3D printers are especially suited to the production of reproducible components which meet the high level of quality for high-end markets including aerospace, industrial and medical.

The recently developed CeraFab S230 has the largest build platform in the CeraFab System family. The first machine will be shipped in early 2020. The specifications of the CeraFab System S230 include lateral resolutions of 75 µm, layer thicknesses of 25 – 200 µm and build volumes of 192 x 120 x 320 mm.

At Formnext 2019, Lithoz will demonstrate a variety of applications for diverse industry sectors, ranging from ceramic cores and shells for investment casting, industrial and machinery components, up to implants for medical and dental.



Visit Lithoz GmbH at Formnext 2019: Hall 11.1, D32

HOW TO OVERCOME WEAK POINTS IN THE SLM PROCESS



In order to establish Additive Manufacturing (AM) as an industrial process for serial production, it is essential to develop efficient manufacturing practices. With this goal in mind, three highly specialized, medium-sized companies from Germany are joining forces to form a network called AM Powder Plus (AMP+). Assonic Dorstener Siebtechnik GmbH, Solukon Maschinenbau GmbH and ULT AG offer integrated solutions for highly automated parts and powder processing and handling in the SLM process (selective laser melting).

This includes the collection, sifting, reprocessing and drying of surplus powder in the metal PBF process with automated component removal and depowdering for clean transfer to post-processing. Unexposed powder is returned to the PBF process in a fully processable state, assuring occupational health and safety, dust explosion protection, and a clean working

environment.

The AMP+ partners have encountered blind spots in the process chain, that have so far prevented industrial users from making widespread use of this new technology. These shortcomings are concentrated on a section that lies between the completion of printing and the start of post-processing. The result is a need for inefficient manual work and unnecessarily high consumption of costly metal powders. There is also the challenge of avoiding explosion hazards and of airborne pollutants, which have negative effects both on employee safety and health, as well as on production plants and products.

Visit Netzwerk AMP+ at Formnext 2019: Hall 12.0, C119

Photos: Lithoz, AMP+



BIKE SADDLES WITH A LATTICE DESIGN

With UV-based printing technology known as Digital Light Synthesis (DLS) and its EPU 41 material, California's Carbon, Inc. is entering highly sensitive territory: the production of custom bike saddles. Renowned manufacturers Specialized and Fizik are the first partners to have adopted the technology, which is novel in this particular area.

Form, stability, cushioning, power transfer: A bike saddle is expected to meet specifications that are sometimes contradictory. In leveraging the DLS approach, Specialized (with its S-Works Power Saddle) and Fizik (with Adaptive) are counting on the technology's ability to combine these factors in optimal, yet customizable ways.

Both saddles are based on a lattice structure made of synthetic resin. Additive manufacturing makes it possible to create individual zones with different levels of cushioning – all

with a degree of precision Carbon claims is virtually impossible with foam materials. Fizik, for its part, is looking to make Adaptive customizable to each customer's needs. Its vision is to have riders come to stores to have their own specific load profiles measured on a saddle and then use this data to create individually optimized seats (as in the case of custom shoe insoles, for example). Here, Fizik also has a database containing over nine years' worth of information at its disposal.

Visit Carbon at Formnext 2019: Hall 11.1, E21



Primož Roglič, one of the world's best professional cyclists, is among those who have already taken a look at these new 3D-printed saddles

Photos: Carbon



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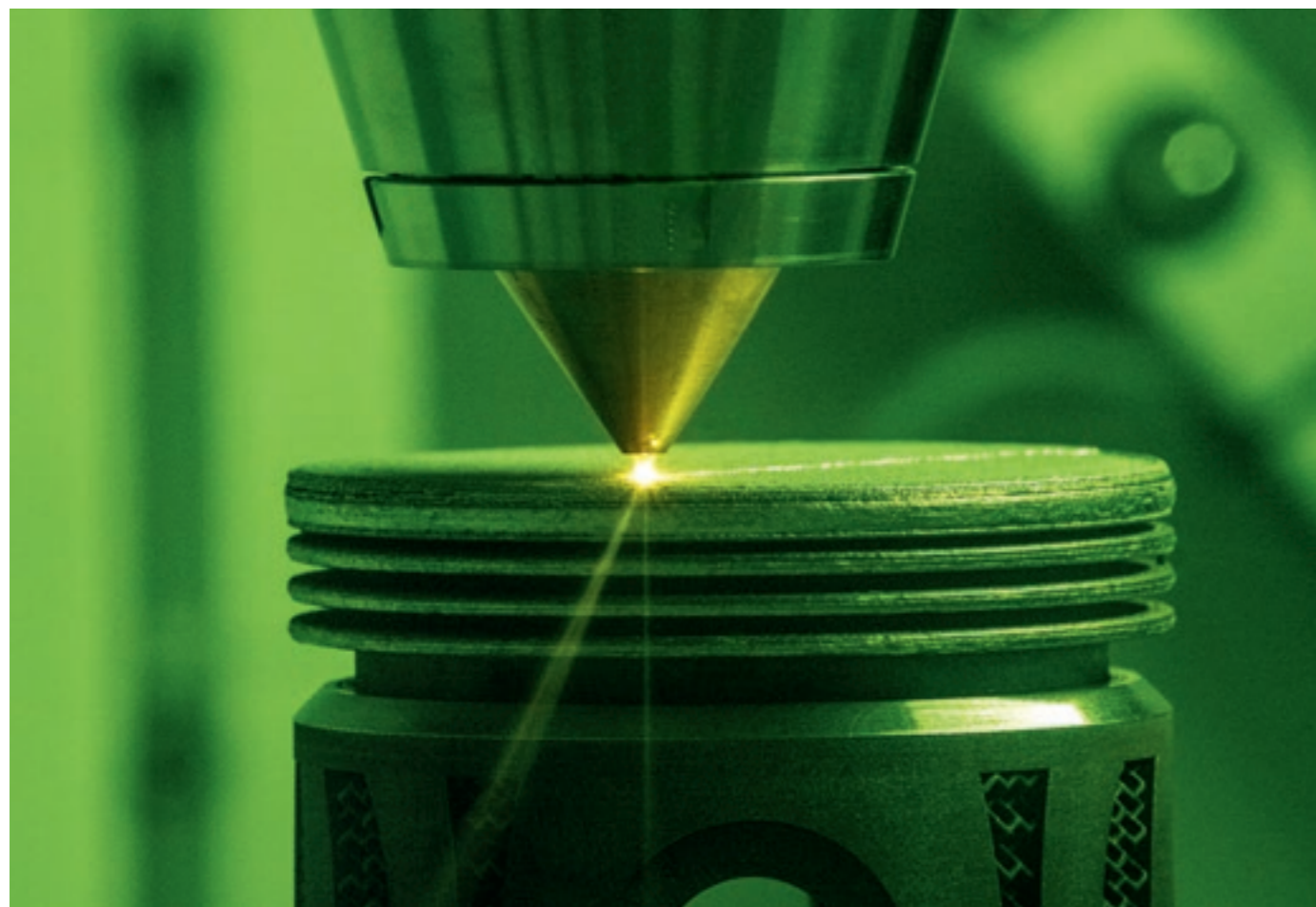
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DED PROCESS MONITORING AND VIBRATING POWDER DELIVERY SYSTEM

With its DED (Directed Energy Deposition) systems, the French manufacturer BeAM has already managed to convince well-known customers such as PFW Aerospace, Safran and Voestalpine of this relatively new technology. At Formnext, the Strasbourg-based company will also be presenting technological enhancements to its bestselling Modulo 400 machine.

These include a new vibrating powder delivery system with up to four feeders. For process monitoring, BeAM is now showing an integrated pyrometer (radiation thermometer) for melt pool monitoring. In addition, in cooperation with Precitec and Siemens, the development of a closed-loop standoff distance control system is being planned.

In order to improve the possibilities for adaptive repair, BeAM presents a touch probe system with automatic tool change as well as the possibility of using a digital twin to simulate the build and avoid collisions. In the materials sector, the company also offers a new system for processing several materials (as a sandwich or in a functional gradation).

BeAM is also showing new innovations in the smaller Modulo 250, which, as Business

Development Director Frédéric Le Moullec reports, is already in use at numerous universities and research institutes in Brazil, Russia, Canada and Japan.

With 60 employees at the locations in Strasbourg, Cincinnati and Singapore, the young company has three DED machines in its portfolio (Modulo 250, Modulo 400, Magic 800) and also offers software and technical service.

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Hall 12.0, C22



Photos: BeAM

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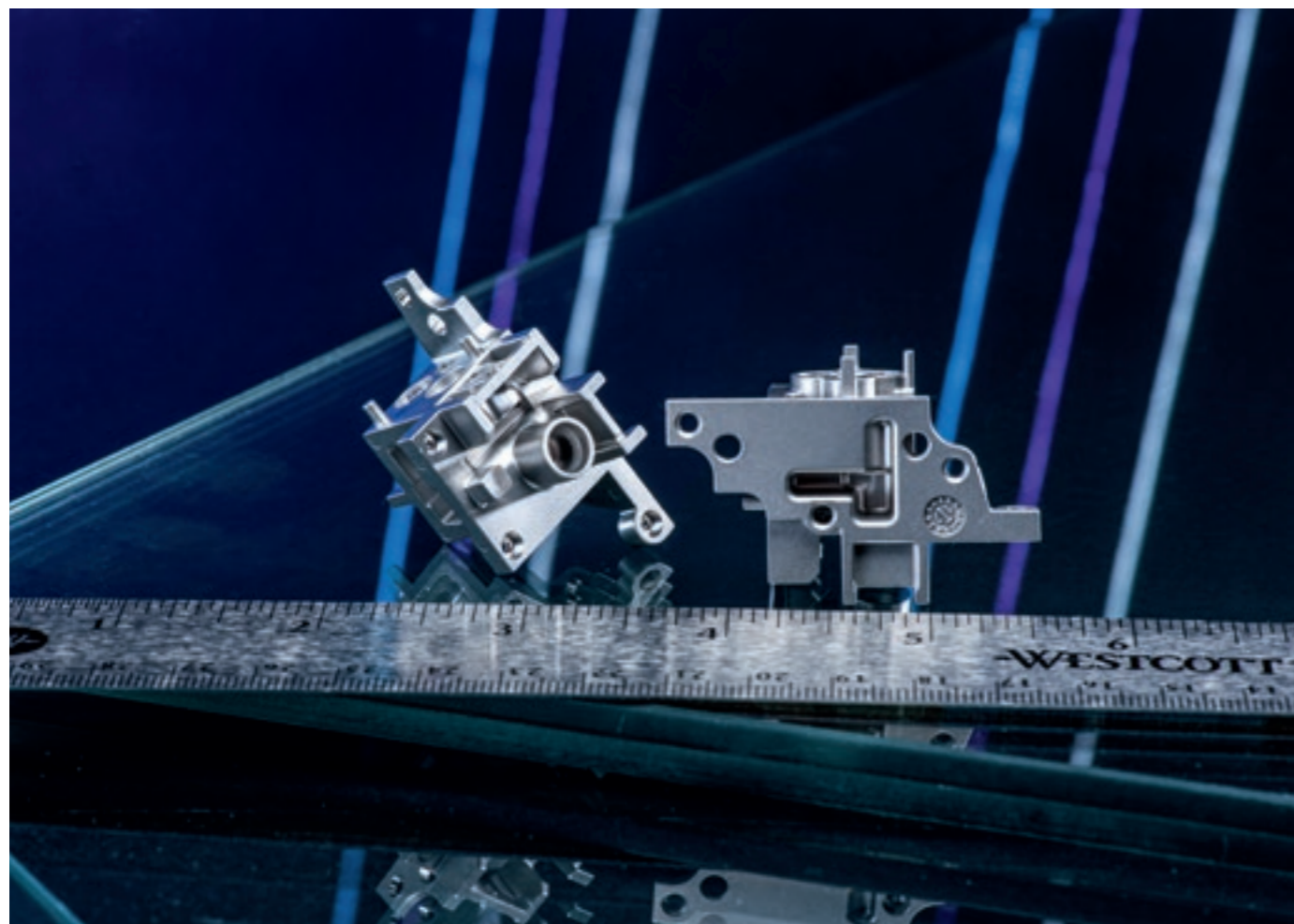


Photo left:

This stainless steel gas-tight flow block component is part of the specimen inlet module of a gas chromatography machine. Remarkably, Metal Injection Moulding delivers a close to net shape part, with the only secondary operation needed being the tapping of threads in the pre-formed holes. The part won a Metal Powder Industry Federation (MPIF) Grand Prize in 2018 for AMT Pte, Ltd, Singapore. Source: MPIF

Photo below:

Rolls-Royce's newest business jet engine, the Pearl 15, is equipped with metal injection moulded (MIM) Inconel 713LC single-ended stator vanes manufactured by Schunk Sintermetalltechnik GmbH. Here, the stator vanes are shown after injection moulding (right), debinding (centre) and sintering (left). Source: Schunk/Rolls-Royce

THE INTERFACE BETWEEN AM AND MODERN MASS PRODUCTION

International PIM/MIM/CIM showcase highlights use in numerous fields of application

by Nick Williams

For the first time, Formnext 2019, in cooperation with PIM International magazine, will present an international showcase of components manufactured by Metal Injection Moulding (MIM) and Ceramic Injection Moulding (CIM). These processes, also known by the

umbrella term Powder Injection Moulding (PIM), deliver everything from high-temperature superalloy aero engine components to cases for the finest Swiss ceramic watches.

With the aid of more than one hundred components manufactured using MIM and CIM, visitors to Formnext will be shown the capability of these metal and ceramic powder-based technologies for the mass production of high-precision, net-shape components from the most varied materials.

Sascha F. Wenzler, Vice President Formnext at Mesago Messe Frankfurt GmbH, sees the addition of MIM and CIM to Formnext as a sensible extension of the show: »After all, Formnext is more than a pure AM trade fair, and shows modern production processes with AM at the centre,« he stated. »And additive manufacturing and PIM technologies can complement each other very well. There is a lot of commonality with the powders used in MIM and Powder Bed Fusion processes and, with the evolution of metal Binder Jetting and Fused Filament Fabrication, well-known MIM producers such as GKN Powder Metallurgy, Par-



Rolls-Royce's Pearl 15 engine also uses MIM levers to adjust the angle of inflow of variable stator vanes in the compressor. Source: Rolls-Royce/Steffen Weigelt



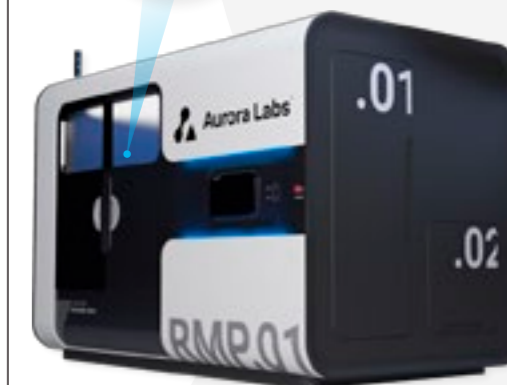
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matech, Indo-US MIM Tec are further leveraging the synergies between two very closely related AM processes.«

POOL OF POTENTIAL CUSTOMERS

The growing number of partnerships between Binder Jet AM equipment companies and MIM producers not only bring on board experienced teams of metal powder and sintering specialists who can help refine the various systems and processes to deliver AM's promised results of faster speeds, high reproducibility and lower costs, but also deliver a ready-made pool of potential customers who may be new to AM, but who are already comfortable with MIM processing.

In addition, one of the most widely discus-

sed barriers to the faster growth of the Metal Injection Moulding industry relates to the complex tooling required in the MIM process chain. Due largely to the cost of this tooling, which can run into the tens of thousands of dollars, MIM production volumes still typically start at around 50,000 parts per year. This has long presented the promise of a lucrative business opportunity for anyone with the ability to produce small, complex, MIM-like components in such relatively low volumes.

ATTRACTIVE PROPOSITION FOR MIM PRODUCERS

Whilst there are some successful MIM companies who specialise in lower volume parts production, metal additive manufacturing »





Photo on top:
A selection of Metal Injection Moulded parts showing the range of shapes and sizes that can be manufactured by the technology, typically to net shape. The smallest part here is a 316L stainless steel locking device for a spectacle frame hinge, weighing 0.028 g and produced in volumes of more than 4 million parts a year. The largest part is a 316L tripod base which weighs 260 g and is 65 mm high. Source: PIM International

has in recent years become an increasingly attractive proposition for MIM producers seeking to take advantage of this opportunity. Conversely, MIM producers may of course have the ability to pick up business when components that may be destined for Binder Jetting reach higher production volumes.

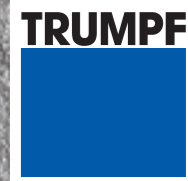
Whilst it is by no means clear just what percentage of MIM producers have already started adding AM capabilities in-house, either for small series production, prototyping or simply for the manufacture of fixtures and tooling, there is sufficient evidence to suggest that momentum is building quickly. The range of volumes at which AM is more economical than conventional processes is undoubtedly increasing, and the opportunity to diversify beyond conventional MIM markets is an added draw.

Metal Binder Jetting and Fused Filament Fabrication additive manufacturing technolo-

gies are only just moving towards industrialisation. It will take time for them to be widely accepted as proven processes for industrial applications. How these ›MIM-like‹ processes will compete with MIM in the future is the question of the moment. There is a lot of ›low-hanging fruit‹ in the MIM portfolio that could easily be snapped up by AM processes as the technology evolves – parts that have production runs in the tens of thousands are obvious examples. What is certain is that both AM and PIM have a bright future ahead.

Discover the story of MIM in the current issue of PIM International:
www.pim-international.com.

Discover PIM | MIM | CIM
Hall 11.0, A59

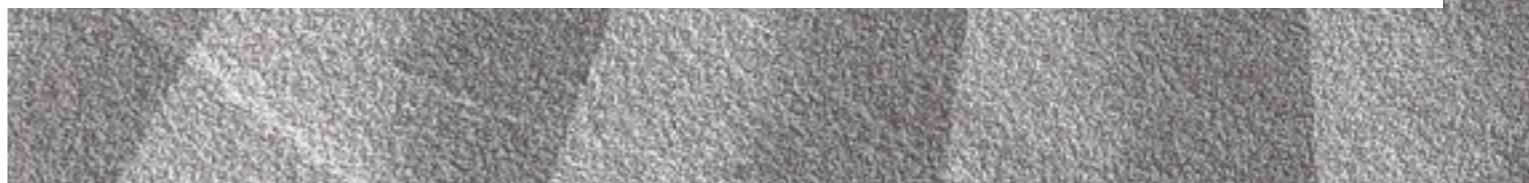


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QUALITY ASSURANCE FOR BLASTED SURFACES

With its new technology, Bernstein Mechanische Fertigung GmbH (BMF) wants to revolutionize the post-processing of AM components. It has been working with the Chemnitz University of Technology and a measurement equipment manufacturer to lay a foundation for reliable quality assurance in connection with blasted component surfaces.

Known as Smart Surface Control (SSC), the technology offers an Industry 4.0-ready process chain for sandblasting the surfaces of components, as BMF reports. In addition to this in-house development, the Saxony-based company has introduced a new technical basis for measuring and assessing surface properties, as well as an intelligent algorithm that provides product-specific blasting parameters.

The SSC technology makes it possible to take direct control of the actual construction process in additive manufacturing. Along with shorter build times that are facilitated by rapid blasting, this new technique is the first to offer



complete and reliable quality assurance for blasted surfaces. Some initial manufacturers involved in AM are already reaping the benefits of SSC.

The technology, which will be on display at this year's Formnext, represents BMF's current effort to devise a post-processing strategy that

supports mass production in additive manufacturing.

Visit Bernstein Mechanische Fertigung GmbH at Formnext 2019: Hall 12.0, C40

NEW WIRE LMD HEAD

The Fraunhofer Institute for Laser Technology ILT is tackling the issue of 3D printing large components economically by using a new process called Hybrid AM that combines conventional manufacturing with additive processes. An important step forward in this process development is a new wire LMD head and its modular components, which will be presented for the first time at Formnext 2019.

Conventional manufacturing processes are gradually reaching their limits whenever large and complex, individual metal components need to be manufactured. The Fraunhofer ILT is working with industrial partners to develop new processes for integrating hybrid laser material deposition (LMD) processes into the production chain.

The main features of the new processing optics are its directional independence and uniform intensity distribution of the laser beam intensity over the ring. Since reflective optics

are used, such as copper in this case, high powers in a wide wavelength range are possible. Wire LMD can be used to manufacture components in a very high quality without pores and with extremely low post-processing requirements. In addition, the new head enables welding on 3D surfaces.

Since the application process can be controlled accurately, the process is stable even on large components and at high deposition rates, while maintaining consistent quality. For this purpose, the geometry of the component is continuously recorded in order to adapt or correct the path planning with the aid of this data. An inert gas cell also allows users to repair titanium components in an argon atmosphere or to produce fully additive titanium components using 3D printing.

Visit Fraunhofer ILT at Formnext 2019: Hall 11.0, D51



Close-up view of the wire LMD with coaxial ring beam. Source: Fraunhofer ILT, Aachen, Germany / Volker Lannert.



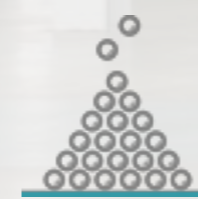
no laser



no powder



no filament



granular material



pellet extruder



open material system

Photos: Fraunhofer ILT, Bernstein

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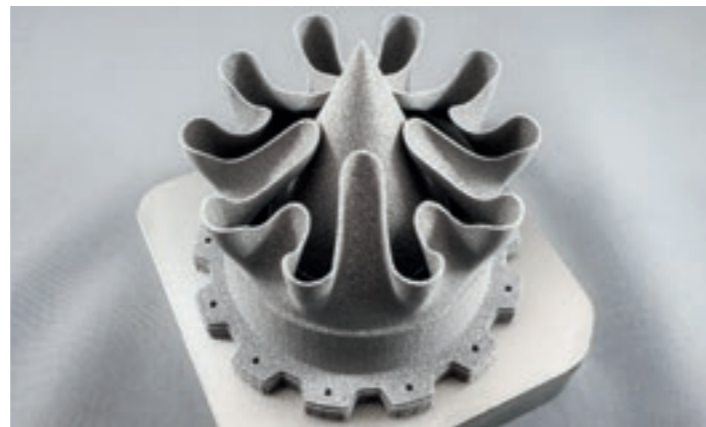


350 KG PER DAY

Additive manufacturing of metallic products is rapidly progressing in terms of speed and cost, as Aurora Labs reports: The Australian company could increase the speed of its Rapid Manufacturing Technology (RMT). Latest speed tests have demonstrated a print speed of 350 kg/day. The Company has been able to achieve these speeds during around-the-clock testing, carried out on the RMP1, which is the first model of the RMT range of metal printers.

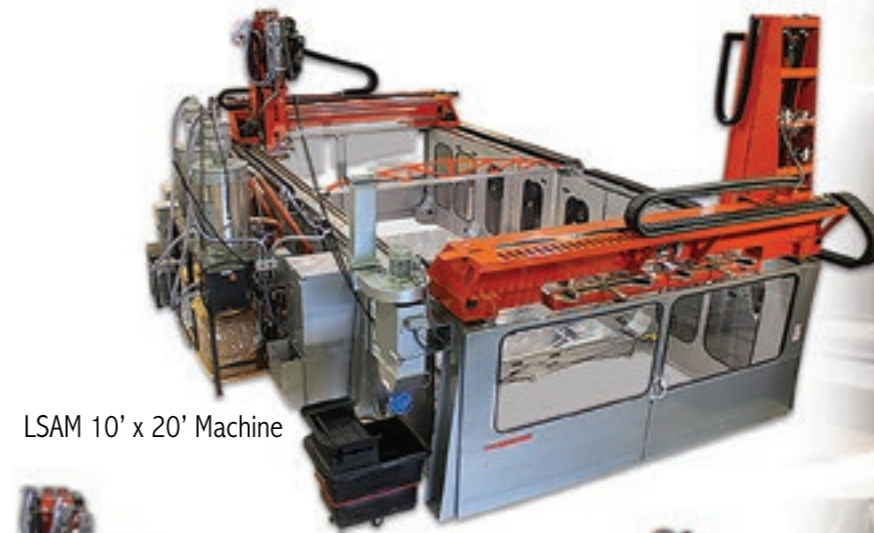
Mr. David Budge, Managing Director, comments: »Our RMP1 machine has the ability to produce high quality parts, in a timeframe of hours – as opposed to traditional parts manufacturing that can have lead times of months. When you consider that we recorded print speeds of 15,8 kg per day on the Alpha Printer last September, this equates to a greater than 2000 % speed improvement in 12 months.«

Aurora is fielding interest from a number of potential users from the field of medical, aerospace, and automotive. Budge sees the advantages of his technology within the potential to reduce costs and free up capital that is currently locked away in spare parts inventories.

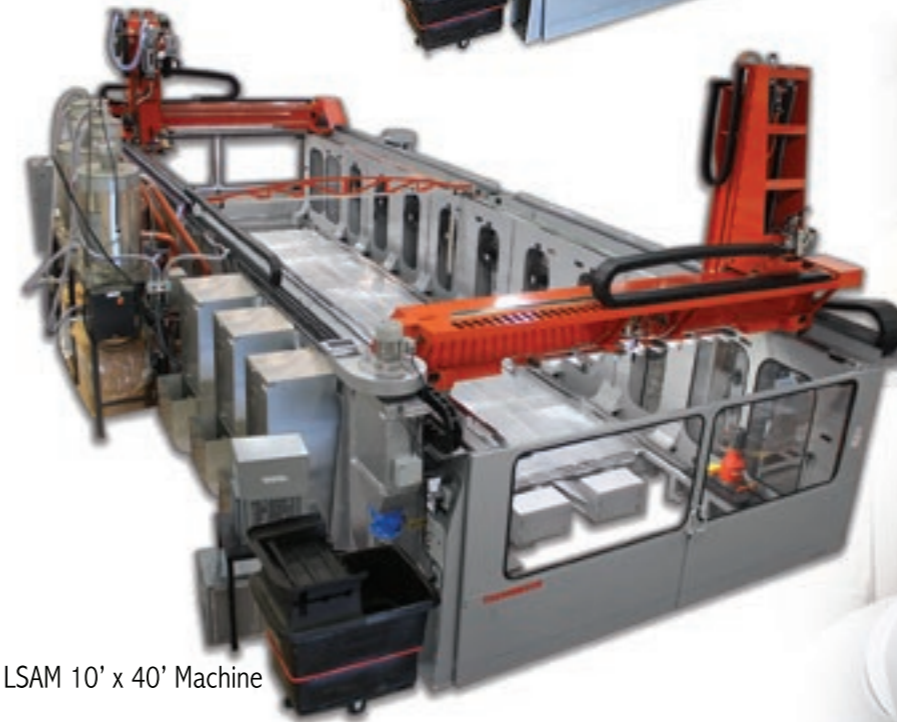


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Ampower presents an extensive study on additive metal manufacturing around the world

An Ampower study set for presentation at Formnext 2019 projects that the market for 3D metal printing will grow by an average of 24% over the next five years. »The interesting thing is that the corresponding expectations of supply chain providers, users, and potential customers are virtually identical,« reports Matthias Schmidt-Lehr, co-founder and CEO of Ampower. »It's a sign that the hype is over and we're no longer looking at a pull market.« Instead, investments are being directed toward specific requirements.

A Hamburg-based consultancy that specializes in additive metal manufacturing, Ampower interviewed more than 150 companies around the world about their current and future use of 3D metal printing. This has now resulted in the first »Additive Manufacturing Report«, which offers a comprehensive picture of the global AM market in metals.

In global terms, some 8,000 installed systems are currently 3D-printing approximately 4.3 million metal components. With revenues of

just over €800 million, the metal AM system sector only amounts to around 1.5% of the market for conventional CNC systems. That figure is expected to rise to as much as 3% by 2023.

The Ampower study also points to dynamic developments in additive manufacturing technology. While binder jetting and deposition welding are riding high thanks to numerous planned investments and strong growth rates, the growth in selective laser melting has cooled off considerably. »We could even see a slight contraction in that area next year,« reveals Schmidt-Lehr, who nevertheless sees reasons for optimism in SLM. »The market for laser melting systems has reached a point where numerous applications are undergoing qualification. Once this is done, we expect the market to pick back up again in 2021 and 2022.« After all, he says, the demand for this technology remains high – in aviation and oil and gas, for example, as well as in plant engineering.

The automotive industry, on the other hand,

is placing high expectations on binder jetting technology based on the simple fact that it can produce greater quantities in an efficient manner. »We're now seeing this at every OEM in automobile manufacturing,« Schmidt-Lehr reports.

These developments are also reflected in the use of specific materials. Here, titanium has already reached a considerable level at approximately 1,000 tons per year; according to the Ampower study, that number will rise to around 1,500 tons in the years ahead. That said, the largest increase is being seen in stainless steel – the material used most often in binder jetting processes.

Visit Ampower at Formnext 2019:
Hall 11.0, C29
» additive-manufacturing-report.com

Grafik: Ampower

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MEASURING LARGE PULSED LASERS

MKS Instruments will present at Formnext 2019 the Ophir L2000W-PF-120 Laser Power/Energy Sensor, a water-cooled sensor for measuring large pulsed lasers. The thermal sensor measures powers from 1 W to 2000 W and energies from 6 J to 6000 J over the spectral range of 0.3 μm to 2.2 μm .

The L2000W-PF-120 features a large 120mm aperture to accommodate high energy densities and short pulses. A fast response time balances the need to measure fast drifts and instabilities with the ability to handle high energy levels.

Pulsed ns or ps lasers can induce optical damage. To address this, the sensor features a PF type volume absorber that is able to withstand higher average energies and energy densities, up to 3 J/cm².

The L2000-PF-120 includes a »Smart Connector« interface that operates with the company's

Centauri, StarBright, Vega, Nova II, and StarLite smart displays, and Juno and Juno+ compact USB PC interfaces. The displays also feature sophisticated logging of power and energy, statistics, histograms, and more, as well as advanced math functions.



Visit MKS Instruments / Ophir Spiricon Europe at Formnext 2019: Hall 12.1, E19



NEW HEAT TREATMENT PROCESS

Roboze will show at Formnext 2019 the new Heat Treatment Process, capable of covering all the necessary phases for the production of functional prototypes and finished compo-

nents with composite materials and high temperature super polymers.

After the product innovations the company has shown over the last few years Roboze is

getting ready to become a provider for the management of the entire manufacturing process of high temperature and composite materials, from the pre-printing procedures to the post-processing.

Roboze product portfolio includes now a Filament Dryer, designed ad hoc to dry and monitor the quality of the filaments before and during the printing phase. This new device, in addition to increasing the quality of the finished products, offers the automatic loading of the filament.

In order to meet the needs of thermal post-processing for the crystallization of the printed parts, Roboze includes within the process the new HT Oven, developed and produced with the aim of improving the dimensional stability at high temperatures and reducing any residual stress. The device is provided together with all of the company's printers that are not equipped with heated chamber.

Visit Roboze at Formnext 2019: Hall 12.1, C61

Photos: Roboze, MKS Instruments



»METAL PARTS« MADE OF PLASTIC

Formlabs is demonstrating on a concept car from Volkswagen USA how surfaces and components that appear metallic can also be produced using faster and easier plastic technology.

Volkswagen's »Type 20« concept vehicle is a modern reimagining of a classic VW microbus from 1962, and a showpiece for the automaker's next-generation technologies, including a set of highly expressive cast-aluminum wheels. Those wheels needed hubcaps that drew on VW's iconic styling while still fitting properly among the organic forms of the spokes.

The hubcaps were printed on a Formlabs desktop SLA 3D printer using Clear Resin, then electroplated with a 0.004-inch-thick layer of nickel. The resulting parts look and feel like metal, but they could be produced quickly as designs evolved, with minimal geometric constraints.

Electroplating 3D printed parts is available in a wide variety of metals, including gold, nickel, and copper. Plated parts can be polished, brushed, bead-blasted, or coated like any thin metal surface. RePliForm, the plating service



that Formlabs and Autodesk worked with to produce the VW hubcaps, has found in tests that electroplating increases the tensile strength of SLA prints by 3x, flexural strength by nearly 10x, and stiffness by 4x.

At the same time, »metal parts« are created which are relatively light - especially if they are not solid but hollow or filled with a grid structure. This makes the process ideal for automotive prototyping and other fields where metallic finishes are crucial, but it also works well for production parts that need to have the external characteristics of metal at the lightest possible weight.

Visit Formlabs at Formnext 2019: Hall 11.1, F11

Photos: Formlabs



Equipped with »Multiplate«, the TruPrint 1000 3D printer's recoater pushes the substrate plate into the overflow container after printing. Source: Trumpf

INDUSTRIALIZATION OF AM IN THE DENTAL INDUSTRY

Trumpf is set to present a new solution that automatically changes substrate plates on the TruPrint 1000 3D printer at Formnext 2019. A function Trumpf calls Multiplate prompts the system's recoater to push the substrate plate into the overflow container at the end of the print run. The 3D printer then automatically goes to work on a new substrate plate. The system can immediately start the next print job without an operator having to open it and insert a new plate.

This saves time, costs and resources, as the company states. It also helps manufacturers avoid bottlenecks when job orders peak, because the machine can run overnight. This solution is particularly well-suited for industries where orders tend to fluctuate greatly. One example is the dental sector, where employees often have to restart 3D printers in the middle of the night to meet delivery obligations. »With our solution, we are making a significant contribution to the industrialization of additive

technologies in the dental industry,« says Florian Krist, product manager at Trumpf Additive Manufacturing.

Trumpf customers who already own a TruPrint 1000 can add the multi-plate function to the system, says Trumpf.

TRUMPF Laser- und Systemtechnik GmbH:
Hall 12.0, E61

FOR MEDIUM SIZED METAL PARTS

Shining 3D launches the EP-M250 Pro at Formnext 2019. The EP-M250 Pro is a dual-laser metal 3D printer that uses advanced metal powder bed fusion (MPBF) technology. The 3D printer is ideal for medium sized parts and small batch production, as the company says.

The dual-laser system offers a build volume of 262x262x350mm and a non-stop operation during filter change. The innovative gas flow management and optimized filter system ensure a stable building environment. The printer also offers real-time monitoring of the production environment and building process. The company promises low operation cost due to an efficient printing performance.



Photos: Trumpf, Shining 3D

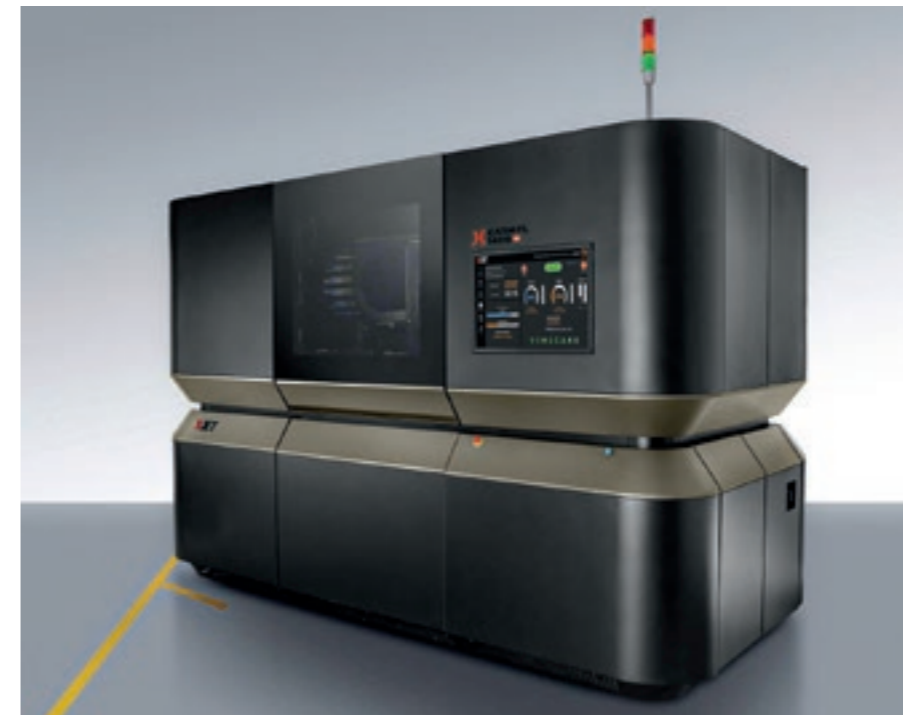
Visit Shining 3D at Formnext 2019:
Hall 11.0, C49



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UpNano develops and manufactures innovative high-resolution 3D printing systems for the production of micro components made of plastic.



CERAMIC APPLICATIONS FOR MOBILE COMMUNICATIONS AND MEDICINE

XJet will demonstrate the Carmel 1400M (metal) and Carmel 1400C (ceramics) as part of an updated product line at Formnext 2019. »Both systems use the same NanoParticle Jetting technology, they are different and have been optimized to handle the different materials.« says Dror Danai, XJET CBO.

NanoParticle Jetting (NPJ) technology enables the manufacture of metal parts that are highly complex, with superfine details, smooth surfaces and pinpoint accuracy.

One of the applications the XJet will present at the show is how researchers at the University of Delaware (UDEL) have developed a new design for a low-cost, lightweight antenna solution that could overcome the challenge of deploying the 5G network affordably. UDEL found XJet NPJ technology to be the only manufacturing process capable of manufacturing the antenna and achieving the complexity,

accuracy and smoothness required for the inner channels of the antenna.

Marvel Medtech has another application in the spotlight at Formnext. The US company developed a robotic intervention guidance system, designed to freeze and destroy the most dangerous tiny breast cancer tumours and prevent them from growing. Medtech is using XJet AM to develop a ceramic cryotherapy probe, a key part of the guidance system, which will work inside an MRI machine so treatment can take place immediately. That's why the highly accurate and complex internal channels being used inside the magnetic field must be produced from ceramic materials.

Visit XJET at Formnext 2019:
Hall 12.1, C01



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DIGITAL MAPPING FOR THE WORLD OF AM

To digitally map the unique world of additive manufacturing and orchestrate related efforts in intelligent ways, Grenzebach is now offering a digitalization platform known as Sericy. »Sericy optimizes the digital integration of processes,« explains Oliver Elbert, head of business development at Grenzebach. »Besides enabling all the departments at a given company to use AM data, the system is designed to accommodate future developments and techno-

logical innovations.« If necessary, Sericy can be enhanced with further modules or programmed in individual apps. A library of microservices that reduce development time is also available.

In the innovation project NextGenAM, Grenzebach (serving as an EOS project partner) helped produce a vision of the factory of the future at Premium AEROTEC's premises in Varel, Germany. The company's self-driving transport vehicle – L1200S, which is part of this

factory concept – will be demonstrated live at Formnext at the EOS booth (Hall 11.1, booth D31).

Visit Grenzebach Maschinenbau GmbH at Formnext 2019: Hall 11.1, A61

HIGH RESILIENCE

With the new polymer material TPU 1301 EOS wants to mark a big step on the way to 3D printing mass production. According to the company, the material offers a high resilience after deformation, very good shock absorption, and very high process stability, at the same time providing a smooth surface of the 3D printed part. Tim Rüttermann, Senior Vice President Polymer Systems & Materials at EOS: »As such the material is particularly suited for applications in footwear, lifestyle and automotive – such as cushioning elements, protective gears, and shoe soles.«



Visit EOS at Formnext 2019: Hall 11.1, D31



»LOTS OF PEOPLE ARE ITCHING TO GET STARTED«

The consistently rapid rate of growth in the world of additive manufacturing is ensuring that specialists are always in high demand. At Formnext, companies can find outstanding new employees – including from various regions of Asia. Exhibitors just need to make corresponding preparations, as HR expert Samia Boutari reveals.

by Thomas Masuch

As a budding industry that combines unparalleled future prospects with a great deal of creative and innovative potential, additive manufacturing is proving highly attractive with graduates and young specialists. Unlike other industrial sectors (and in spite of all the personnel shortages at hand), the world of AM offers plenty of opportunities according to Samia Boutari, senior consultant at the HR and business consulting firm proJob in Cologne, Germany. »It's an industry young people find exciting,« Boutari points out. She goes on to confirm that the demand for talented and qualified employees nevertheless continues to sur-

pass the supply by a significant margin.

In Boutari's view, the sharp increase in the courses and ongoing training offered by universities, industry associations, and other sources has not done much to change the situation because the number of graduates in Germany (and greater Europe) is far from sufficient.

The corresponding job openings show that sectors like manufacturing, food products, consumer goods, and transport are the main areas looking for skilled AM employees. The early adopters of industrial 3D printing in the aerospace, medical technology, and automotive industries appear to be in better positions with

Photo: Mesago / Mathias Kutt

regard to their personnel. Meanwhile, hardware and software manufacturers are also very much on the hunt for engineers and software experts.

All this has prompted Formnext to offer support to both companies and the young specialists and applicants they want to attract at a career day in this year's AM4U area. On the third day of the exhibition (November 21), visitors will be able to learn everything about the job market in additive manufacturing and get to know potential future employers in person. The career day will also feature numerous highlights, including personalized career advice, an application photo shoot, consultations with HR representatives from exhibiting companies, and special presentations on the AM4U stage.

OPTIMALLY TRAINED APPLICANTS FROM ABROAD

After helping to oversee the Formnext career day for three years now, Samia Boutari believes that the event's highly international visitors hold a great deal of recruiting potential for the companies presenting themselves to the world of specialized AM in Frankfurt. »On the one hand, we're seeing a lot of demand for specialists in AM,« she explains. »On the other, you often have applicants who have undergone fantastic training abroad – in India, for example.«

While the market for European AM experts has been more or less picked clean, Boutari has had very good experiences with prospective employees from Asia. »Lots of people are interested and itching to get started, which doesn't always seem to be the case with more local prospects,« she says.

Boutari adds, however, that applicants from distant lands and cultures can still pose greater challenges to many companies. »Small and midsize enterprises in particular aren't adequately prepared; in some cases, they don't even have the basics down,« she says. Boutari has seen enough cases where no internal considerations have been made as to the language

requirements applicants should meet, for example, or where companies opt to leave a position unstaffed for fear of related complications (linguistic or otherwise). »I'd advise companies to just be more flexible in dealing with these situations,« she says. »Otherwise, a lot of resources will remain unused in the end. Leaving a position unoccupied can even result in significant costs, as well.«

»A WELL-PREPARED BOOTH IS KEY«

In her experiences at past editions of Formnext, the HR specialist has learned that Asia is one of the main regions visitors come from with an interest in getting information on career opportunities or particular companies. »It pays to be prepared in this regard, but unfortunately, not all the companies in attendance are,« Boutari says. »Potential applicants often leave a booth with nothing more than a link to a company's website.«

This is why she considers the teams assigned to booths part of the basics of exhibitors' recruiting efforts. »While it might not be an event's main focus, every exhibition is also a place where companies market themselves to the attendees as potential employers,« she affirms.

To better account for this aspect, a booth should have at least one person who is responsible for the topic of employment. In addition, it helps to have young employees on hand who can engage with applicants on equal footing and make it easier for them to approach the booth. Since established experts and managers with steady jobs sometimes still keep their eyes open for new challenges, Boutari also recommends having a separate meeting area where people need not worry about being seen by their current boss.

Visit the AM4U area at Formnext 2019:
Hall 11.1, D29; Career day, November 21, 2019
10:00 am – 4:00 pm

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MINIMUM WALL THICKNESS OF UP TO 0.1 MM

Based on the principle of photopolymerization, the Incus machine »Hammer« opens up new possibilities in the 3D printing of metal components. The new 3D metal printer and the Incus technology will be presented at Formnext 2019.

Thus, parts of a layer thickness of 20 µm and a minimum wall thickness of up to 0.1 mm

and micro-bores of a diameter of up to 100 micron µm generated. Furthermore, Incus' process enables the 3D printing of metals where previous processes have failed, such as non-weldable alloys and hard metals or even metal powders with a significantly smaller particle size.

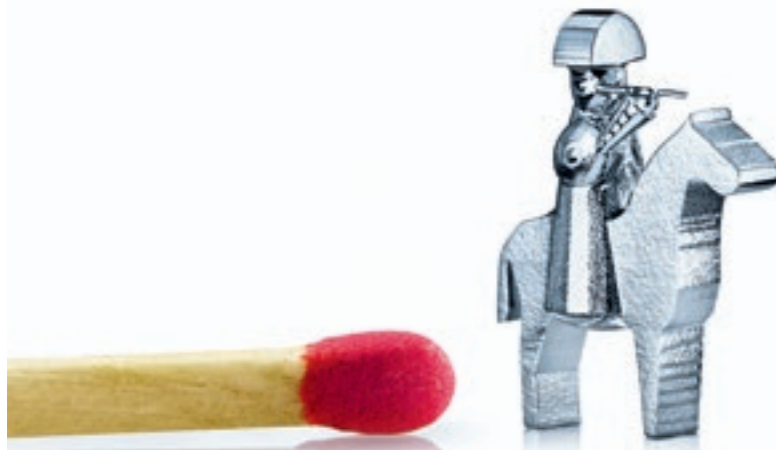
Four Beta 3D metal printers of the Hammer

series have been in continuous use for some time. By using a feedstock, Incus promises cost-saving working conditions by eliminating the need for specialized work spaces or inert gas atmospheres for component production.

Evolved from the company Lithoz, Incus is accompanied by investments company AM Ventures, too. At the same time, Incus is well connected with the founder respective start up scene in Vienna and with research institutions such as the Vienna University of Technology. By moving to it's new location in the Viennese hightech quarter Seestadt the company is creating the basis for further growth.

With the »Hammer« Incus opens new possibilities in metal 3D printing. The rider was surface polished by INP Greifswald.

Visit Incus at Formnext 2019:
Hall 11.1, D32



CUSTOM BRACKETS, FIXTURES, OR FINGERS

The engineering team at USA-based custom robot solution provider All Axis uses 3D printing to produce custom tooling parts—reducing lead times from months to hours for their bespoke robot end-effector designs.

»One of the challenges we faced when adapting our collaborative robots and automation in the machine shop was the need to develop custom parts during the process. We would have to develop custom brackets, fixtures, or fingers for the grippers, and not all of this would be possible to produce on CNC machines,« said Gary Kuzmin, CEO, All Axis.



The company has realized the applications with Makerbot's new Method X. At Formnext, the Stratasys subsidiary presents further practical application examples such as these and shows how additive manufacturing at production level is becoming accessible to a wider range of engineers and manufacturers.

Visit Makerbot at Formnext 2019:
Hall 12.1, F99

Photos: Incus, Makerbot

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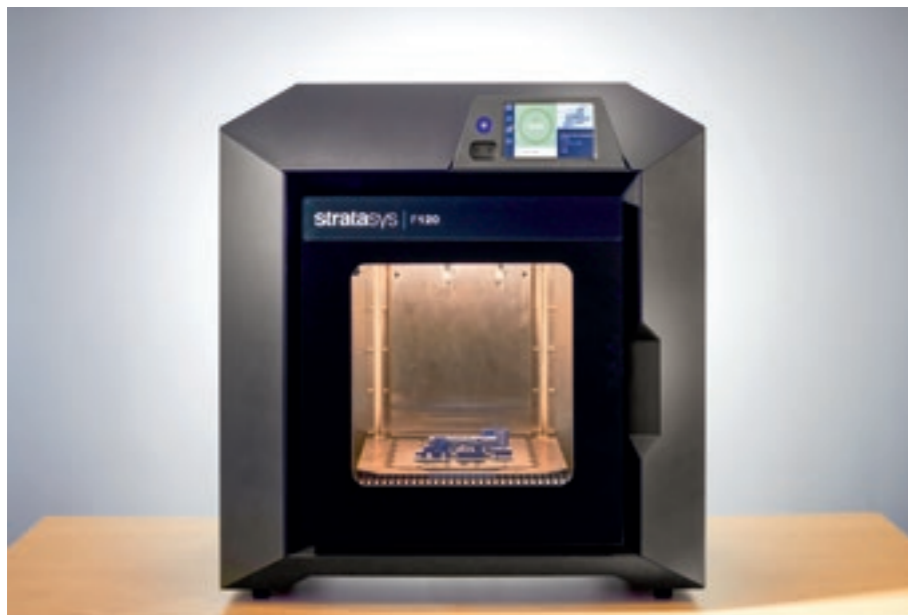
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FOCUS ON INDUSTRIAL-GRADE SOLUTIONS

Stratasys will present a range of industrial-grade additive manufacturing solutions including new hardware, materials and software. Live demonstrations will be shown on Stratasys Fortus systems, the proven manufacturing workhorses, as well as on the large-scale F900. Also on display will be the company's F123

Series of 3D printers, including the F370 and F120 which combine FDM technology with intuitive design-to-print GrabCAD Print software. Stratasys will also provide live on-stand demos of its latest multi-material and full-color PolyJet 3D printing technology. Recently validated to full Pantone specification, this technology enables designers and engineers to



produce complex multi-component prototypes in a single print.

Visit Stratasys at Formnext 2019:
Hall 12.1, D61

BOOSTER FOR PRODUCTIVITY

Set to debut at Formnext 2019, the Axialscan Fiber-20 is described by its manufacturer (Raylase) as a unit that boosts the productivity of modern powder-bed machines in AM thanks to its advance focusing capabili-

ty. Its quadruple configuration enables the deflection unit to achieve a four-fold increase in efficiency over the processing area. Meanwhile, the four modules are particularly optimized for smooth integration and reliable operation

in powder bed (SLM) machines. An additional process-monitoring component also makes it possible to assess the quality of a given AM process whenever required.

In addition, Raylase will be presenting the AM module Next Gen for fiber-coupled lasers, which the company says is practically tailor-made for the production of high-precision components that need to meet special safety requirements.



Visit Raylase at Formnext 2019:
Hall 11, D59

Photos: Stratasys, Raylase

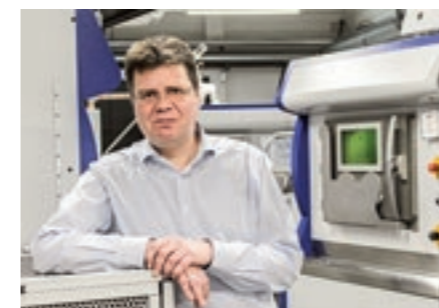
€25 MILLION FOR A NEW CENTER OF METAL EXPERTISE

At its new competence center for 3D metal printing, Materialise is hoping to achieve synergies by bringing manufacturing, software development, and research together in an integrated production and development facility. The company is thus investing around €25 million in a new building that spans nearly 40,000 square feet – plenty of space for more than 120 employees and over 30 industrial 3D metal printers.

This expenditure reflects the commitment Materialise is making to the city of Bremen, Germany, and to the local network of innovative technology and development partners that has been growing there since 2011. The company points out that these close collaborative relationships are giving rise to many of the afore-

mentioned synergies, which stand to benefit all providers and customers in additive manufacturing.

At its new competence center, Materialise is also looking to take on the challenges the future of 3D metal printing will present, including by identifying appropriate uses and continuing to increase the efficiency of development and production processes. The overarching goal? To facilitate a constant stream of new and worthwhile applications that work with metal, as well – all the way to custom series production.



Visit Materialise at Formnext 2019:
Hall 12.1, C131

Photos: Materialise

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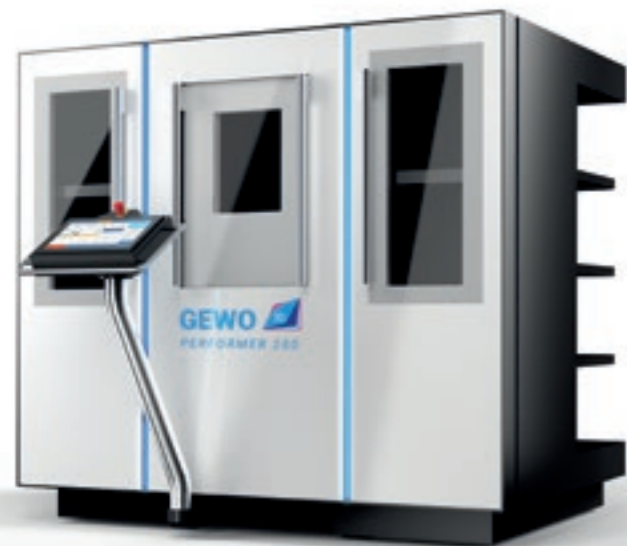
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FFF-PERFORMANCE AS A PRINCIPLE

At Formnext Gewo 3D will be showcasing industrial 3D-printing systems for high-performance polymers in the FFF process (Fused Filament Fabrication). The GEWO Performer 260 printer is a trade fair novelty and represents »a real break with tradition as a special development for high-performance rapid prototyping, manufacturing and tooling«, as the company says. The new printing chamber heater reaches a temperature of 260° C. The maximum nozzle temperature amounts to 500° C

The Gewo Performer 260 delivers maximum material flexibility and excellent scalability for hardware and software updates. When updates take place, the Performer 260 can be retrofitted quickly. 46 sensors constantly monitor and adjust the printing process and filaments, and are the reason why the GEWO Performer 260 is

capable of meeting extremely exacting dimensional and tolerance specifications.

The Gewo HTP260 achieves accelerations of up to 6 m/s², travel speeds of up to 300 mm/s and a material throughput of up to 0.5 kg/h. The enlarged printing chamber size in 450 x 450 x 350 mm format ensures that GEWO 3D meets the requirements of many customers in the automotive and aerospace industries who produce larger prototypes, components and tools.

The new patent pending Gewo print head replacement system reduces lengthy bobbin changing times to less than five seconds. When the bobbin is empty, the system automatically switches to the print head with new material and continues printing. The two or four print heads can accelerate printing speed when operated jointly. Milling heads and special tools developed in-house can also be interchanged.

Visit Gewo 3D / Gewo Feinmechanik:
Hall 12.1, B 20

THE HIGHLIGHTS OF FORMNEXT 2019

AM STANDARDS FORUM

19.11., Portalhaus, level 1, room Transparenz 1

CAREER DAY & JOBWALL

21.11., AM4U, 11.1, D29

DISCOVER3DPRINTING SEMINARS

daily, AM4U, 11.1, D29

DISCOVER PIM | MIM | CIM

daily, 11.0, A59

FORMNEXT.TV

daily, Hall 11, Level Via, South

INNOVATION MADE IN GERMANY (BMW)

daily, joint stand 11.0, F51

LIGHTWEIGHT CONSTRUCTION

daily, joint stand 12.0, D95

MATCHMAKING

20.11., Portalhaus, room Transparenz 2

PARTNER COUNTRY PAVILLON USA

daily, 12.0, E101

PURMUNDUS CHALLENGE

daily, showcase 12.1-E01;
21.11., award ceremony, AM4U, 11.1, D29

START-UP CHALLENGE & PITCHNEXT

19.11., Start-up pitches & award ceremony, AM4U, 11.1, D29

TCT CONFERENCE @ FORMNEXT

daily, Portalhaus, room Frequenz 1 & 2

TCT INTRODUCING STAGES @ FORMNEXT

daily, 11.1, F81 and 12.0, B03

USER CASE AREA BE-AM & SYMPOSIUM

daily, UCA 11.0, F68 / 20.11., Symposium, Portalhaus, level, room Transparenz 1

USER CASE AREA VDMA WORKING GROUP AM

daily, 12.0, E42

Photos: Gewo 3D

THE WORLD'S SMALLEST MICROSTENT

3D printing is also making progress in paediatrics: High-precision and extremely small structures with »memory« and variable shape can also alleviate severe congenital diseases in the smallest children. Scientists at the Multi-Scale Robotics Lab at the ETH Zürich in collaboration with the Politecnico di Milano and

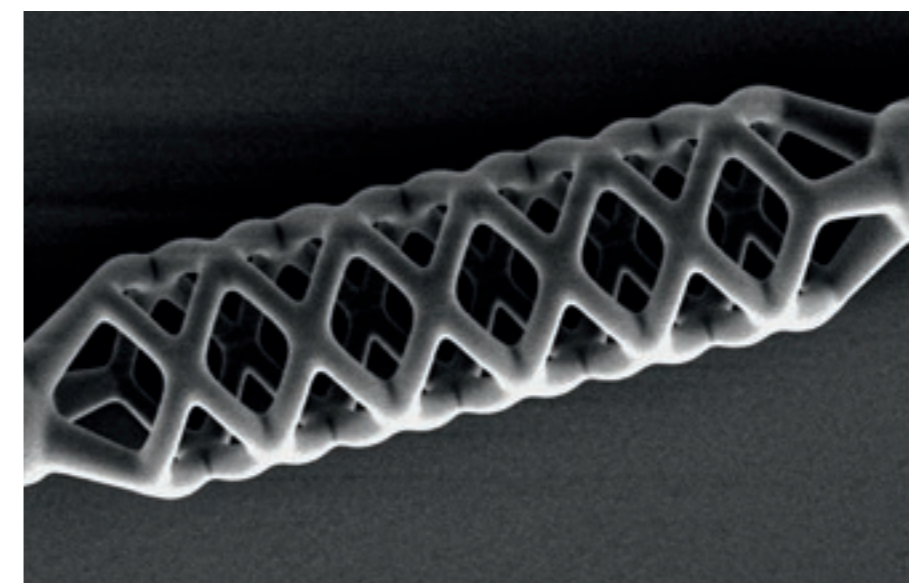
Kantonsspital Aarau used a Nanoscribe Photonic Professional GT system to develop a novel indirect 4D printing method.

This extremely small microstent consists of a structure with shape memory function. Based on Nanoscribe's 3D printing technology, researchers developed the world's smallest micros-

tents made of soft and responsive components.

The 3D printed sacrificial templates of the lattice scaffold are fabricated by Nanoscribe technology and subsequently molded into shape memory polymers (SMP) to adopt the complex 3D shape of the printed template. The shape memory microstents are able to deform under heating and cooling conditions, even showing shape recovery.

4D printed microstructures are promising components in microsurgery and further minimally invasive methods for treating medical diseases with high-precision instrumentation. The implementation of soft robotic microstents represents a step forward into applying microtechnologies to solve life-threatening conditions, for example in pediatric diseases such as congenital obstructive uropathies. Under external stimuli these materials transform and undergo physical and chemical changes over time. Thus, the properties of morphing give 4D printing its fourth dimension: time.



Visit Nanoscribe at Formnext 2019:
Hall 11.1 – A74

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thomas.masuch@zikomm.de

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26–28 May 2020

Formnext Forum,
Hamamatsucho Kan, Tokyo, Japan
24–25 September 2020

Following Formnext's success in establishing itself as the most prestigious international exhibition platform for the industrial application of additive manufacturing (AM) over the past five years, a number of international events in strategic locations are set to take place under the Formnext brand starting in 2020.

The inaugural edition of Formnext + PM South China will be held in the new Shenzhen World Exhibition and Convention Center in China from 9–11 September 2020. Formnext and PM (a specialist trade show dedicated to materials) will combine to create a joint event that continues to pursue Formnext's industrial and process-oriented approach while providing an opportunity to meet user industries from the automotive, electronics, dental, jewelry, design, and toolmaking sectors face-to-face. For more details, visit <https://formnext-pm.hk.messe-frankfurt.com/shenzhen/en.html>

At ROSMOULD Moscow, which will take place from 8–10 June 2020, the AM workgroup of the German Mechanical Engineering Industry Association (VDMA e.V.) will follow up its successful 2019 debut by hosting an AM pavilion for the second time. Besides a use case area providing application examples and business

cases, the pavilion will also feature presentations and an exhibition area. The VDMA pavilion perfectly complements ROSMOULD's exhibition program, which focuses on tool- and mold-making as well as modern manufacturing methods. For more details, visit <https://rosmould.ru.messefrankfurt.com/moscow/en.html>

Formnext Forum Tokyo – the exhibition dedicated to acquainting Japanese manufacturers with AM as a cutting-edge technology – will also take place for the second time from 24–25 September 2020. With a conference program and exhibition tailored precisely to the Japanese market, the event does not simply focus on state-of-the-art technology, but also provides a platform for top-class users (such as Panasonic in September 2019) to speak about the successful use of AM in the »Land of the Rising Sun«.

January 2020 marks the premiere of an AM industry round table for the Italian mechanical engineering and user industries at SPS Italia. This will be followed by an opportunity to exchange ideas in an AM area in the District 4.0 exhibition at SPS Italia held in Parma from 26–28 May 2020. SPS Italia is Italy's leading trade show for automation, robotics, and Indus-

try 4.0. For more details, visit <https://www.spsitalia.it/en/home/>

These international brand events accompany and support the parent event in Frankfurt, offering formats and content that are tailored to the requirements of the local markets. As has always been the case for Formnext, the brand events will be developed in close cooperation and collaboration with the industries concerned, the advisory board, and other institutions, associations, and multipliers. This strategy does not favor a »copy and paste« approach but calls for optimum alignment with the local markets at all times and involvement of the partners best suited to the regional requirements. As with Formnext in Frankfurt, Messe Frankfurt's international network provides exhibitors, participants, and visitors with optimum support through its worldwide involvement with its subsidiaries in key core regions and its local integration into brand events.

You can find all contacts and further information at Formnext 2019 – at the brand pavilion located in Hall 11.0, booth A79.



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FormNext

ONE AM Steel Powder for Tools, Molds and Dies Eliminates the Need for PBF Powder Changes

L-40 NEW STANDARD

APPLICATIONS SERVED

- Die Casting
- Hot Stamping
- Cold Forming
- Compression Dies
- Injection Molding
- Specialty Parts

SUPERIOR PROPERTIES DELIVERED

- Hardness tailored from 35-70 HRC
- Outstanding Ductility/Toughness through hardness range
- Superior Abrasion Resistance
- Extreme Dimensional Control
- Excellent Polishability
- Easy to Machine/Cobalt-Free

FULL PROCESS PROVIDED

- Powder Management
- DFAM Assistance
- L-PBF Print Settings (for multiple platforms)
- Heat Treat Protocols
- Print Service Firm Partnerships

Superior Performance/Price to M300 Maraging Steel

FormetrixMetals.com

SELECTION
REVOLUTIONARY UNIQUE
THREE COMPONENTS
GRANDMASTER
NEXT GENERATION
CUSTOMISED ADDITIVE WORLD CLASS
AUTOMATION



formnext

19-22/11/2019
Hall 12.1, stand D-121
Frankfurt am Main,
Germany

WIR SIND DA.

Flexibility in additive manufacturing! This is what our open freeformer system offers. We have now gone one better – with our new freeformer 300-3X. Like its little brother, it does everything a freeformer needs to be able to do. And even more: larger build chamber, three discharge units – now also for complex yet robust hard/soft combinations. Once again: unique in the industry!
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