HESSEN

TECHNOLOGIELAND HESSEN

HESSIAN JOINT STAND FORMNEXT 2019

11.0/E21, Messe Frankfurt

www.technologieland-hessen.de

CREATE.
FUTURE.
NETWORK.

HESSIAN JOINT STAND FORMNEXT 2019

Innovation Center of Additiv Manufacturing

TECHNISCHE UNIVERSITÄT DARMSTADT

UNIKASSEL VERSITÄT

THM
TECHNISCHE HOCHSCHULE MITTELHESSEN

Continental

Continental Engineering Services

sauer product

FIBER THREE
MATERIAL

apc·tec
PROCESS.ENGINEERING

PERLON®
The Filament Company

FrankfurtRheinMain GmbH
International Marketing of the Region

conspir3D

Cover picture: Hessen Trade & Invest GmbH

CONTENT

Having successful key players in all segments of the value-added chain is a trait that defines every strong economy. In Hessen, we are fortunate that not just one, but several industries show these highly rewarding chains: One of those is the emerging and rapidly developing industry around Additive Manufacturing – an amazing innovative technology, with disruptive potential for almost every industrial production process and which has decisive impact on key technologies like lightweight design, industry 4.0, medical technologies and more. Being a key enabling technology itself, Additive Manufacturing presents for many companies an opportunity to become, or stay, a key player.

At Hessen Trade & Invest we assist hessian companies becoming successful in their field. Our endeavor to develop the hessian economy is best expressed by our motto: **Think innovative. Act international.** We connect the whole spectrum of industry, research, administration, communities and politics with each other and give new innovations a forum.

Dr.-Ing. Carsten Ott
Head of department
Technology & Innovation
Hessen Trade & Invest GmbH

Therefore, our exhibition stand at formnext is an embodiment of our work: It shows a broad range of innovative ideas in and around additive manufacturing, by small and medium sized companies, start-ups, research institutions and big, global players: It is a representation of hessian ingenuity and of the strength of the hessian economy.

We are proud to be part of formnext for the fifth consecutive year and wish a highly successful and informative fair!

HESSEN TRADE & INVEST
Hessen Economic Development

TECHNOLOGIELAND HESSEN
Create. Future. Network.

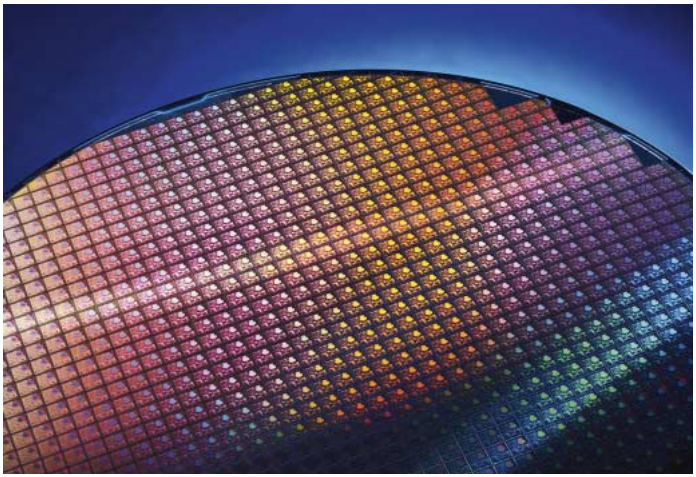
HESSEN TRADE & INVEST – BUSINESS PROMOTER FOR HESSEN

Hessen Trade & Invest GmbH (HTAI) is the economic development organization of the Federal State of Hessen. Our task is the further sustainable development of the Hessen business and technology location in order to consolidate and expand its competitiveness. Through targeted activities, we contribute to maintain and increase the prosperity and living standard of all Hessian citizens in the long term. To achieve this, we work together as partners with the business, scientific, administrative and political sectors.

Under our brand name **Technologieland Hessen**, Hessen Trade & Invest GmbH combines technological innovations and promotes the development, application and marketing of key technologies in Hessen on behalf of the Hessian State Ministry of Economics, Energy, Transport and Housing.

www.htai.de **www.technologieland-hessen.de**

Hessen Trade & Invest GmbH



Hessen Trade & Invest GmbH

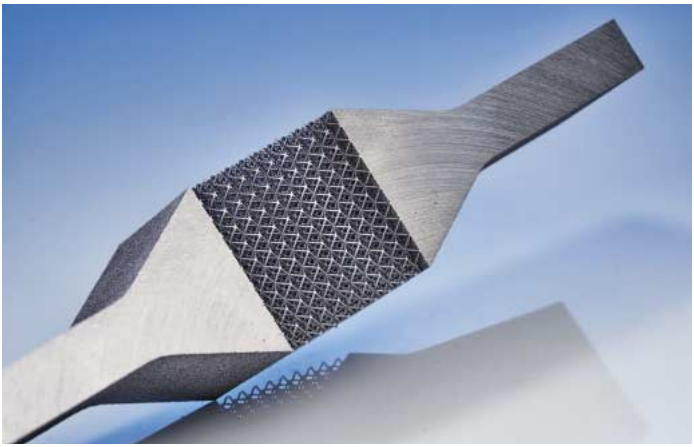
MATERIAL TECHNOLOGIES

The competence field Material Technologies supports small and medium-sized companies in developing and applying key technologies of the 21st century. Our assistance focuses on the following topics:

- **Additive Manufacturing**
- **Material- and Nanotechnology**
- **Battery Materials and Technology**
- **Lightweight Design and Bionics**
- **Optical Technologies/Photonics**
- **Microsystems Technology/Printed Electronics**

Our services comprise networking of players through trade and networking events and enabling trade-fair participations. We offer newsletters and magazines with information on current technological trends and market opportunities. We promote and foster technology transfer from research and development to its market.

With the Hessian Material Industry already playing an essential part in our economy with 450 companies and the multitude of Hessian research institutes active in this field, there is great potential for Hessen in the vitally important field of Material Technologies.



Hessen Trade & Invest GmbH

ADDITIVE MANUFACTURING – GETTING A HEAD START WITH 3D-PRINTING

Sometimes referred to as 3D-printing, additive manufacturing offers improved flexibility in construction and production. This innovative technology field creates new business models and changes production processes. Combining innovative production methods with modern information technology opens great potential for companies in global competition. Especially in application and research, Hessian companies are well established in this innovative market. In production, additive manufacturing already plays an important role: Printing lampshades or parts for the automotive or building industry is everyday business. Even complex components for industrial machines are being printed. Moreover, large-scale production is possible using metals or plastics as printing materials. The competitive edges of such miniaturized plants are at hand:

- Additive manufacturing qualifies for constructing prototypes and individualized products as well as for series-production.
- Customization of the construction data is possible anytime.
- New designs can be realized fast; therefore, the automotive industry uses additive manufacturing for new prototypes and tools.

The competence fields **Production** and **Material Technologies** of **Technologieland Hessen** offer networking, consulting, informative events and brochures to make this topic easily accessible and connect suppliers with users.

Hessen Trade & Invest GmbH

The different disciplines covered by our competence field material technologies are closely cross-linked and show several synergies. To recognize those and use them to match suitable partners is at the core of our endeavor. In this context, additive manufacturing is a key technology: It enables you to create and produce new designs and to apply new concepts as, for instance, bionics in lightweight design.

www.technologieland-hessen.de/produktion

www.technologieland-hessen.de/materialtechnologien

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PROCESS.ENGINEERING

3D PRINTING – MORE THAN JUST PROTOTYPES

FROM PROCESS OPTIMIZATION TO HYBRID ASSEMBLIES

In today's world, the implementation of digital and waste-free value creation is becoming more important. To meet the trademark "Made in Germany" traditional manufacturing processes must be called into question. Industry 4.0 means digitizing the production, from the order to the finished product.

Starting from quantity 1 we can manufacture your idea individually, without exploding the costs.

Additive manufacturing expands the list of production options and completes the digital value chain. With this type of production, the designer is given completely new design options. Since there are few standard rules, it is very time consuming and costly to deal with the new possibilities. This requires a lot of initiative from designers and developers.

In the application of additive manufacturing, only as much material as needed is used for the finished product. Components can thus be produced weight-optimized, cost-efficient and resource-conserving.

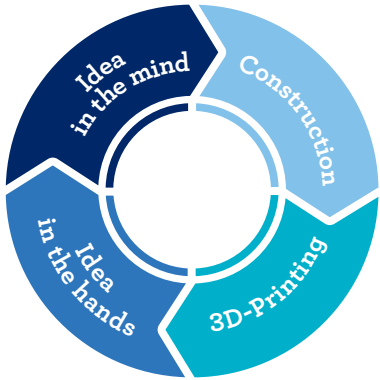
At this point we want to support you:

We are specialists in the design and manufacturing of 3D printed products. The value-added takes place from the idea to the finished product, including surface treatment and assembly, in our company.

We support you as a system provider in the:

- Process optimization
- Construction and production of innovative products
- Assembly fixtures
- Prototypes
- Serial parts
- Hybrid assemblies/fixture
- Training – additive manufacturing (3D printing)

PRINT YOUR MIND



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Continental

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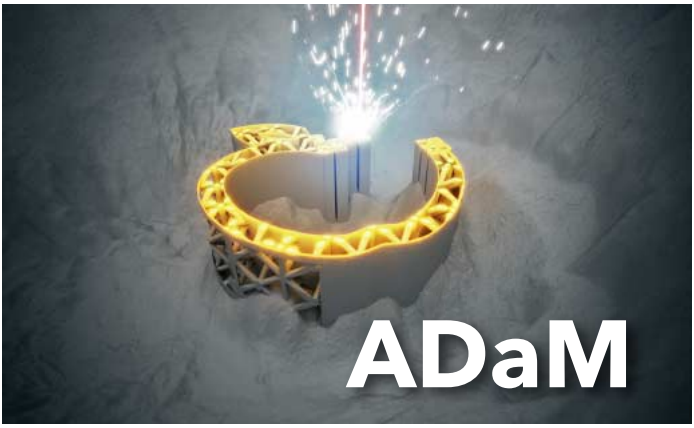

ADDITIVE DESIGN & MANUFACTURING SERVICES FROM INDUSTRY EXPERTS

Continental's Competence Center for Additive Design and Manufacturing (ADaM) offers perfect production solutions for prototypes and small series to internal and external customers.

Additive Design

Based on requirements in regard to structure, material and part environment, team ADaM develops bionic structures and works on topological optimization to turn customers visions into reality.

Additive Manufacturing

Additive manufacturing enables the realization of complex shapes, geometries and bionic structures, the integration of functions and to achieve the highest degree of individualization. The layer construction processes are highly efficient without complex tooling. ADaMs portfolio of additive technologies features:

- Selective Laser Melting
- Selective Laser Sintering
- Stereolithography
- Fused Deposition Modeling
- Digital Molding

Not only post treatments such as wire eroding, machining, blasting, laser polishing, coating and painting; but also advanced processes such as thermoforming, vacuum casting and 3D laser welding are performed within the department.

Located in a production area of more than 500 square meters in Karben (Germany), ADaM competence center from Continental Engineering Services creates first-class conditions to pool the expertise gained from the many production processes within Continental and to make this know-how accessible for its low volume, high performance and niche customers of all industries.

ADaM is looking forward to realizing your product ideas!

Continental Engineering Services

Founded in 2006, Continental Engineering Services (CES) has evolved into a leading engineering and production partner for automotive and industry customers. Headquartered in Frankfurt am Main (Germany) and with more than 1.800 employees located in 20 facilities worldwide, CES can offer a local customer access to ADaM as well as many other manufacturing capabilities. As a fully owned subsidiary of Continental AG, the company provides customized solutions for technologically challenging tasks or adapts proven mass production technologies, thus reducing costs.

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FIBER THREE
MATERIAL

FROM ENGINEERS, FOR ENGINEERS:

ENFORCED MATERIALS FOR ADDITIVE MANUFACTURING

The team of Fiberthree manufactures high strength filaments for the latest generation of FFM printers.

The actual portfolio is based on tailor-made polyamides **with short carbon or glass fibers**. Complemented with the right ecosystems, the materials are designed for easy printing to obtain parts with extreme strength and temperature stability up to 120°C.

Printing with our enforced polyamides, offers a very **cost competitive alternative for parts normally produced by CNC milling or injection molding in small series**.

The high tensile strength given by the fibers combined with the freedom of additive manufacturing enables a solution with less weight compared to the original design – and printed in a few hours after the design.

Your applications:

- Jigs, fixtures, jaws
- Tools for inspection and machining
- Trays, pucks for automated conveyor systems
- Orthopedic applications
- Electrical housings
- Functional prototyping

Your benefits:

- Production time to availability
- Weight to strength ratio
- Energy savings in automation
- Realization of complex geometries

We offer also the related service for engineering and manufacturing in our own printer park from a single part to serial production.

This enables customers to quickly receive demo parts and printer settings or to outsource the production when preferred. With 25 printers for FDM and DLP process we can offer short lead times.

START WITH
THE RIGHT
MATERIAL

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Managing Directors

FrankfurtRheinMain GmbH
International Marketing of the Region

Westend61 | gettyimages

FRANKFURTRHEINMAIN – BECOME A PART OF IT!

We are FrankfurtRheinMain GmbH International Marketing of the Region, an organization comprised of multiple districts, towns, and cities in the FrankfurtRheinMain region. Our objective is to showcase and actively market the numerous strengths of our region. In addition, we utilize a targeted and strategic approach to position and highlight the region in the global market.

Our main activities take place in cities abroad. In particular, our offices in London, Chicago, Shanghai, Pune, and Tokyo serve as a one-stop-shop for all inquiries related to setting up a business in FrankfurtRheinMain. In addition, FrankfurtRheinMain GmbH remains the centralised office for investment in the region including related inquiries from abroad.

FrankfurtRheinMain is among the most rapidly growing global economic centres. Centrally located and with convenient access to customers not only in Europe, but also around the world, the region remains an unmatched business investment destination. Businesses from a wide range of industries enjoy favourable and advantageous business conditions in the region.

Reasons to invest in FrankfurtRheinMain:

- State-of-the-art infrastructure
- Highly efficient access to European and global markets
- Frankfurt, the financial centre of continental Europe
- The world's largest Internet hub
- Highly qualified talent pool
- Research and scientific clusters
- High degree of purchasing power
- Multiple industries including a large number of global leaders and competence clusters
- A vibrant international community
- Leading international location for trade fairs, conferences, and conventions

Last but not least: Unmatched quality of life.

How we can help you?

We are your main point of contact when it comes to setting up your business operations in the FrankfurtRheinMain region and can support with the following:

- Providing a personalized facilitation service
- Organising prearranged and customized location scouting visits
- Identifying sites across the entire region
- Facilitating connections to local industry and business networks
- Establishing contact to international tax and labour law experts
- Assisting with work/residence permit applications
- Providing sector and industry insights

Please contact our experts for additional information.

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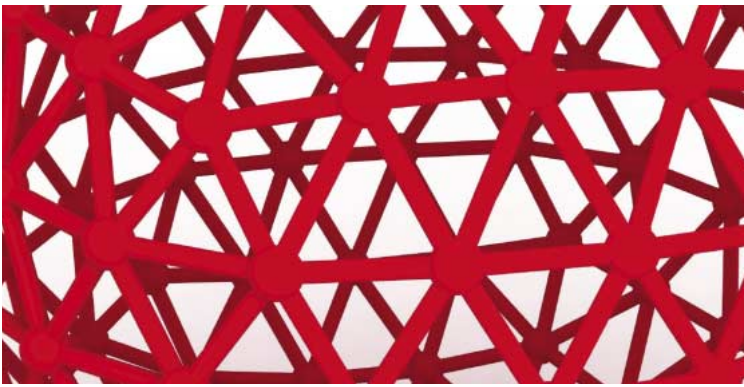
PERLON®

The Filament Company



INNOVATION BY PERLON®

FILAMENT SOLUTIONS FOR UNIQUE PRODUCTS

PERLON GROUP

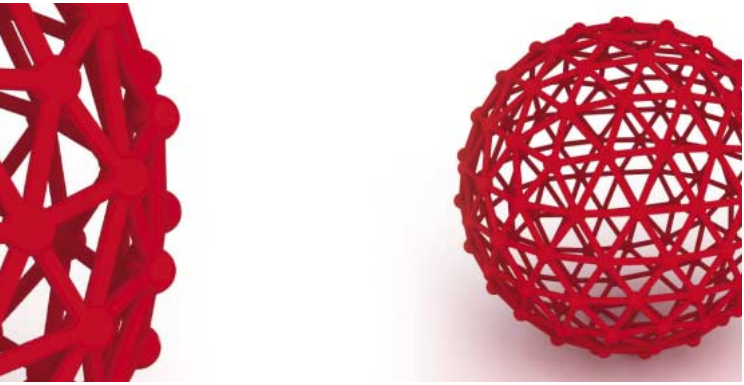
- The world's leading filament producer
- Innovation Leader
- No. 1 in several market segments

INNOVATION by Perlon®

Whichever innovation is next to see the light of day depends on the requirements of the customers, on the needs and developments of the markets or on you. Are you looking for a filament to suit your purpose exactly? We'll make it! Perlon is your contact when it's about creating new solutions for unique products.

Our research and development department with its excellent chemists, materials scientists, engineers and technicians combines depth of knowledge of the chemical and physical characteristics of the raw materials with years of experience in the optimum modification and processing to a high quality filament tailor-made for the customer.

Perlon®
3D Printing
Filament



ADDITIVE MANUFACTURING – Fused Filament Fabrication (FFF)

PERLON® 3D PRINTING FILAMENTS

- Made in Germany by Pedex GmbH, a member of the Perlon Group
- Diverse material range on request: ABS, ASA, PC, PA12, PLA, PEEK, PEEK-CNT, PEI, PEI-CF, PET-G, PETG-Alu, PETG-CF, PET-CF, PP, PVA, TPE, TPU, TPS
- Standard stock items available: PERLON® Performance-PLA, PET-G

PERLON® CUSTOMIZED MANUFACTURING

- Toll manufacturing of 3D printing filaments on an industrial scale
- Tailored filament development

RESEARCH PROJECTS

- Partner for Universities and Institutes
- Member of various research networks

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sauer product

WE THINK AM

The company sauer product sees itself as a professional partner from the development process all the way to the production of sophisticated plastic assemblies. Especially in the field of light-weight technologies, we use the latest applied technologies, such as MuCell®, GID technology as well as product-specific production technologies.

Our claim is to execute entire projects from a single source.

As a pioneer in the generative production of prototypes, sauer product has been operating in this field since 1988. Over the years, new technologies have always been created in combination with new materials. Every single technology has specific individual strengths and every prototype is different – for a design study a perfect surface is mandatory, while in a functional prototype features such as heat and chemical resistance are critical.

In order to be able to offer you an optimal solution for your application, sauer product presents itself with a wide range of prototyping technologies. These are conventional methods and innovative technologies.

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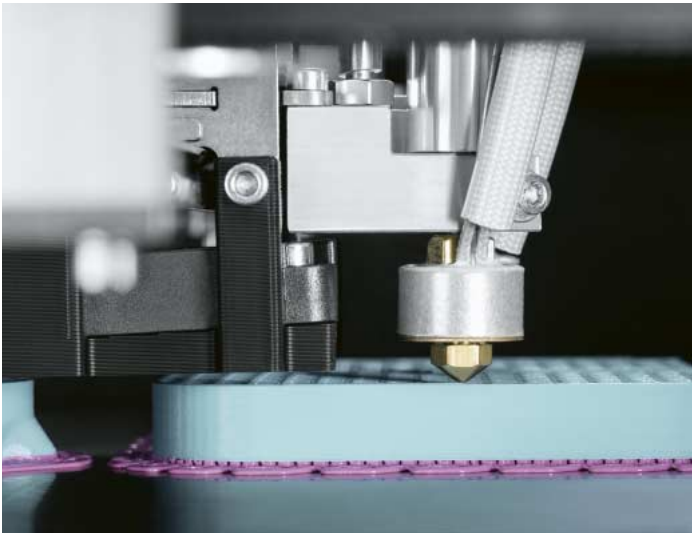

CONSPIR3D GMBH

Conspir3D GmbH was established in 2016 as a service and machine provider for industries which specialize in customized machines and solutions for polymer laboratory and production applications.

- Independent machine manufacturer & customized solution provider
- Reliable partner in various R&D-projects
- Specialist in additive manufacturing

Developing customized, scalable, repairable and sustainable 3D-printers, is our strength; reflecting our endeavor to produce and deliver printers made in Germany fitting every costumers special requirements.

As founder of the former German RepRap GmbH, Jan Giebels (CEO) founded Conspir3D GmbH to match the individual needs of manufacturers having big visions and special applications. From R&D to integrated production arrays of standardized and serviceable solutions, Conspir3D GmbH matches your needs and helps you realize your innovative ideas, which is best expressed by our motto:

The more innovation you need,
the more innovative solution we invent!

Additive manufacturing is our passion, our products and services are distinguished:

- Printers Made in Germany
- Customized machines for special requirements
- Individual training, services and consulting
- Special materials applications and distribution
- Our printers can process plastics as well as metals – depending on your requirements

Research & educational projects

- Specialized partner in various AIF/ZIM projects
- Solution-inventor for R&D
- Bachelor- / Master thesis
- Cooperation with University of Applied Sciences Darmstadt

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UNIVERSITY OF APPLIED SCIENCES

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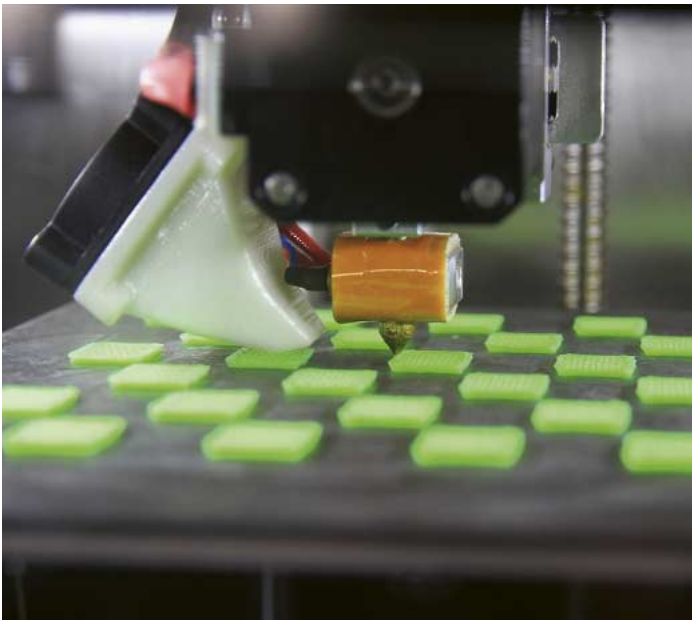

KNOWLEDGE AND TECHNOLOGY

TRANSFER IN THE FIELD OF INNOVATIVE 3D MANUFACTURING TECHNOLOGY FOR INDIVIDUALIZED MEDICINE

The aim is to transfer practical knowledge and technology to companies. The target group consists in particular of companies in the medical and pharmaceutical sectors. They should profit from know how compiled at the University of Applied Sciences.

Focus of knowledge and technology transfer

- Production of patient-specific pharmaceuticals
- Support of cardiac surgery by providing patient-specific 3D models of the heart
- Development of individualized anthropomorphic phantoms for radiology and radiotherapy
- Rapid Prototyping for MRT Multichannel Technology

Goals of knowledge and technology transfer

- Conversion of application-related work into products
- Increased competence in 3D printing
- Stabilization of production areas
- Development of new production areas

go.thm.de/wtt-3dim

Investition in Ihre Zukunft

Investitionen für diese Entwicklung wurden von der Europäischen Union aus dem Europäischen Fonds für regionale Entwicklung und vom Land Hessen kofinanziert.

HESSEN

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Innovation Center of
Additiv Manufacturing

TECHNISCHE
UNIVERSITÄT
DARMSTADT

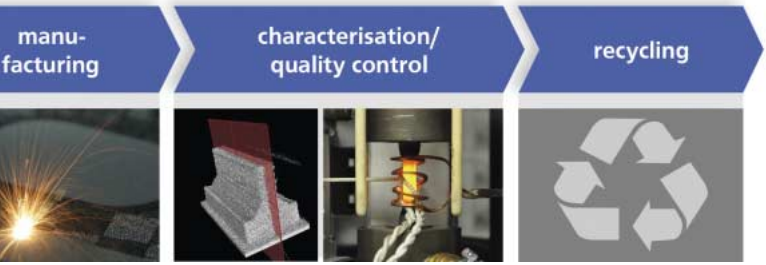
ICAM – TECHNOLOGY TRANSFER FOR THE COMPLETE ADDITIVE PROCESS CHAIN

Despite the huge opportunities related to additive manufacturing processes, two major barriers still prevent the broad employment of additive manufacturing (AM) techniques:

- **Insufficient knowledge about the relationship between AM-process parameters, resulting material behaviour and structural integrity under service loads**
- **Poor dissemination of knowledge about AM-compatible design processes**

The mission of the "Innovation Centre Additive Manufacturing" – ICAM, a project planned by multiple institutes of the TU Darmstadt is to eliminate these barriers. Available competencies, existing and new equipment will be concentrated in one institution, covering design, powder production, manufacturing, post processing, quality control, characterization and recycling.

In direct cooperation with academic experts, all relevant process steps along the entire product life cycle can be developed in the scale of a pilot plant. ICAM will be accessible for joint development programs to support and speed up the technology transfer to industry, in particular to start-ups, small and medium enterprises.



The scope of the centre covers a wide range of materials (plastics, metals, glass, concrete, functional materials) and methods (SLM, SLS, lithography, FDM) but also incorporates material characterization methods such as µ-CT, electron microscopy or nano-hardness as well as testing facilities to evaluate AM components under structural loads.

ICAM is aiming to be a powerful driver for unlocking the full potential of additive manufacturing techniques by applying the latest developments in the digital transformation of product design, fabrication and reliability analytics.

One very important part of the technology transfer will be professional training for engineers, technicians and trainees from the industry. In these training courses the results from the academic research will be disseminated for a direct application, thus preparing future AM-engineers or AM-technicians for their complex tasks.

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UNIKASSEL VERSITÄT

INSTITUTE OF MATERIALS ENGINEERING METALLIC MATERIALS

UNIVERSITY OF KASSEL, GERMANY

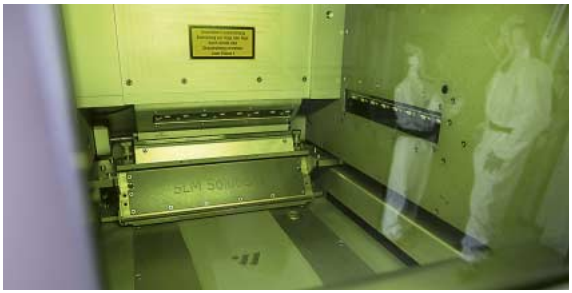
In the Metallic Materials Group at the Institute of Materials Engineering (University of Kassel, Germany), research is basically focussed on the correlation between process, microstructure and resulting mechanical properties of metallic components. Within this framework, four subgroups in close collaboration concentrate on the following main research topics:

- Additive Manufacturing
- Shape Memory Alloys
- Near Surface Behavior / Fatigue
- X-Ray analysis of phases, texture and residual stress states

Apart from the above mentioned topics, High Entropy Alloys as well as Welding Technology are also topics of interest.

In all cases, basic and application-oriented aspects are considered. Furthermore, the evaluation of material issues and damage events often is conducted for industrial partners by the internal testing

laboratory Center of Surface Layer-Analysis and -Technology (Zertech). A wide range of modern testing equipment is available for all purposes. Besides several computer-controlled X-ray diffractometers for stress, phase and texture analysis, computed tomography and high-resolution electron microscopy allow deep insights into the processed materials. The additive manufacturing laboratory is equipped with a system for selective electron beam melting and a system for selective laser beam melting. For better understanding of micro-welding processes in additive manufacturing, standard software for modelling is used, e.g. based on finite element analysis. In addition, the Metallic Materials Group uses computer-controlled mechanical and servo-hydraulic testing machines of various capacities for carrying out complex fatigue and crack propagation



investigations under complex loading conditions. From cryogenic to high temperature, from low-cycle to very high-cycle fatigue tests are conducted, including sophisticated in-situ observations. For assessment of reliability and structural integrity it is essential to understand individual processes and their influence on microstructure and mechanical properties in order to provide for components with tailor-made properties for any application. Prospects and challenges of digitalization of machining processes, granularity of information and eventually digital twins are assessed in interdisciplinary collaborations. In this regard additive manufacturing is thought to be the key process towards Materials 4.0.

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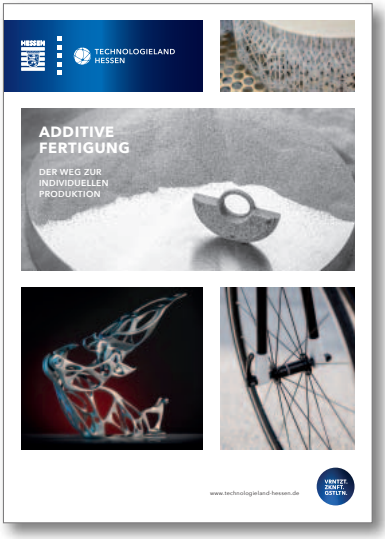

Additive Manufacturing – The path toward individual production

Contains insight on potentials regarding the 4th industrial revolution, explains additive manufacturing technologies, shows paths for new value generation thanks to additive manufacturing and highlights 17 success stories from industry and research in Hessen.

Lightweight Design – Potentials, Projects, Players

Gives an overview of possible applications of lightweight design und introduces 23 players from industry and research that deal with the topic of lightweight design.

All publications available online for download:
https://www.technologieland-hessen.de/publikationen
Selected publications also available in English.

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Kaiser-Friedrich-Ring 75
65185 Wiesbaden, Germany
www.wirtschaft.hessen.de

LAYOUT

Theißen-Design, www.theissen-design.de

PRINT

Printworld | Klimaneutraler Druck

wird beim Druckauftrag erzeugt und ersetzt

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