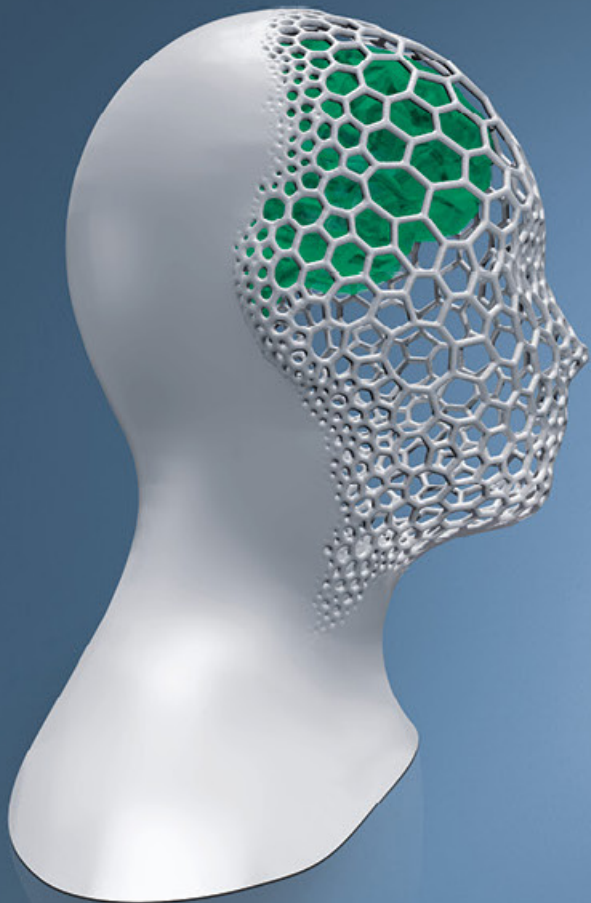


**USE OUR KNOWLEDGE FOR
YOUR ADDITIVE FUTURE**



OUR SERVICES

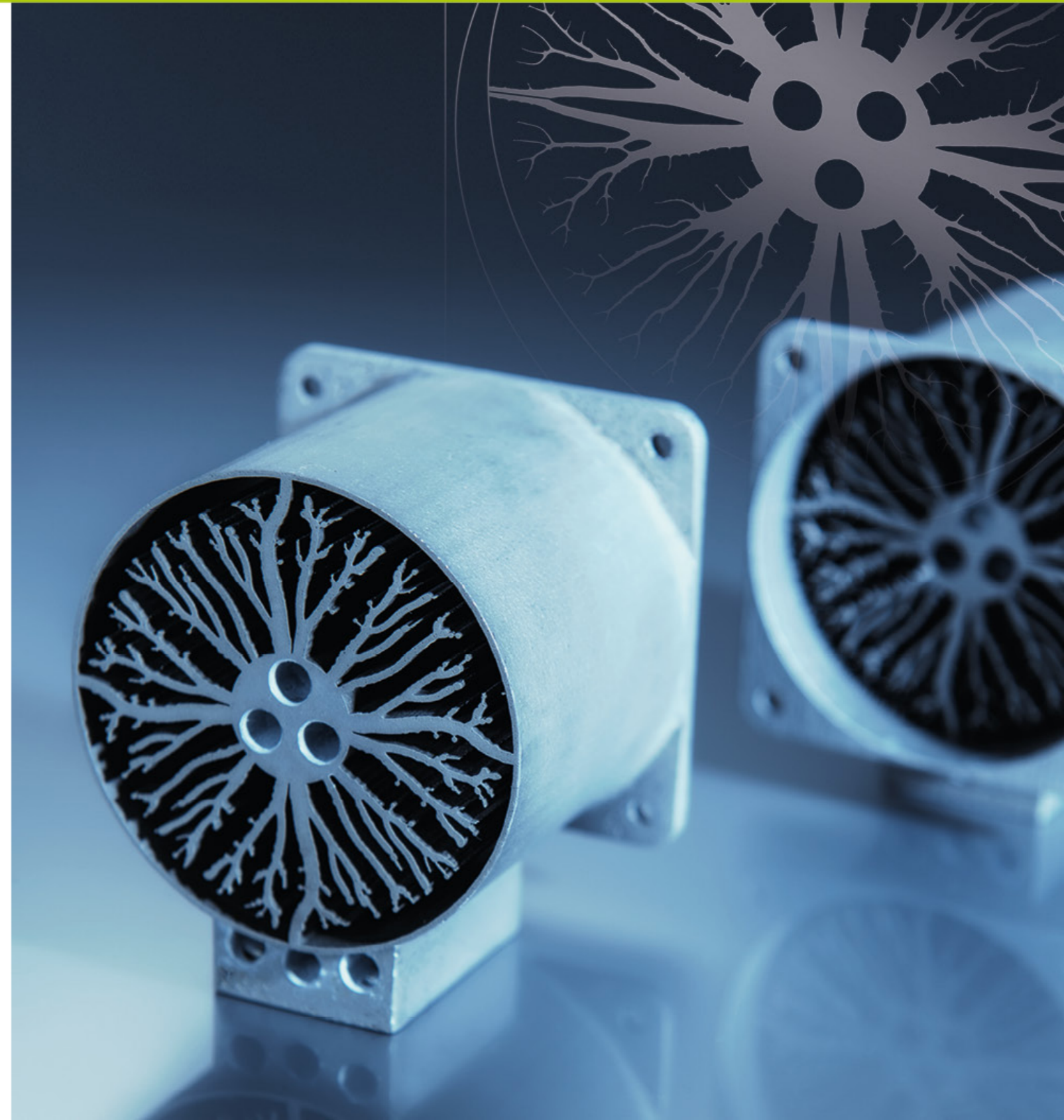
MASTERING CHALLENGES TOGETHER

Based on almost 15 years' experience in industry and applied research, we possess a broad wealth of knowledge that goes well beyond manufacturing alone. With a strong focus on the user, we take an interdisciplinary approach when examining the entire value chain of additive manufacturing, allowing us to provide you with the services that add individual value, irrespective of your current level of knowledge. We boost the roll-out of your technology, giving you a real competitive edge in terms of time and profitability.



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Further information:
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PART SCREENING

IDENTIFY THE TRUE POTENTIAL OF YOUR PRODUCTS

The advantages of additive manufacturing are clear: improved products thanks to functional design, lightweight construction, and integration of parts. These opportunities often go unnoticed, however, because evaluating the technical feasibility requires additive expertise. That is why our part screening service is the key to revealing the potential of your products and thus optimizing them.

Feasibility study

Our special feasibility screening examines technical and economic aspects to identify the most suitable additive manufacturing applications for you. On the basis of your data, our experts assess the technical practicability. In order to guarantee economic viability, our cloud-based platform compares conventional production methods and batch sizes with the results of additive manufacturing to produce authoritative advice.

- Analysis of your data
- Technical and economic feasibility report

On-site screening

During a half-day introductory workshop, we give you all the necessary tools for identifying the potential of additive manufacturing and finding suitable parts for the process. We then sit down with you to go through your production operation or product portfolio. Accordingly, suitable applications can be quickly and easily identified then and there. We subsequently produce a detailed report for each of your potential parts.

- Introductory workshop
- Joint analysis on-site
- Parts assessed by Fraunhofer IAPT
- Detailed report on your parts

Screening challenge

Our experts train your employees, giving you an overview of the full potential of the new manufacturing technologies. This newly acquired knowledge helps you to identify suitable applications within your portfolio of parts. A set period of time then follows, during which your employees look for parts in the course of day-to-day business. Our employees supervise this process and subsequently analyze the findings. As a further option, prizes can be awarded for the parts with the greatest additive manufacturing potential.

- Workshop
- Your employees identify parts
- Parts assessed by Fraunhofer IAPT
- Prize-giving ceremony

Further information:
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SPARE PARTS

AVAILABLE ANYTIME AND ANYWHERE

Spare parts produced by means of additive manufacturing can be made available as needed and on short notice, making it possible to react quickly and flexibly to breakdowns. Costs caused by downtime can be cut and parts no longer available on the market can be reproduced. We help you to identify suitable parts, train your employees, and optimize your future spare parts management in order to minimize your stock levels – and thus your costs. If required, the necessary CAD data can be produced by our experts, making it possible to process an order as soon as it has been received.

Manufacturing individual parts

We can manufacture your spare parts on demand in batch sizes of just one single item. In order to avoid unnecessarily high costs, we offer an upstream assessment of whether parts are suitable for the additive manufacturing process on the basis of technical and economic criteria. This, in turn, allows us to produce your parts as and when needed with no major delays.

- Suitability assessment of selected parts
- Redesign in line with the manufacturing process
- Additive manufacturing of the spare part

Screening your range of spare parts

Find out quickly and efficiently which of your spare parts are suitable for on-demand additive manufacturing. Based on this information, we develop a complete additive manufacturing spare parts logistics concept for you, which cuts costs and improves the availability of parts.

- Prescreening with an economic focus
- Expert screening of suitability for additive manufacturing
- On-demand additive manufacturing spare parts logistics

Spare parts workshop

We give you the necessary knowledge to exploit the full potential of spare parts produced by means of additive manufacturing. In our workshop, you will learn how to identify suitable spare parts and prepare them for the additive manufacturing process.

- Additive manufacturing processes and material properties
- Process chain and logistics
- Identification and assessment of parts
- (Re)design for additive manufacturing

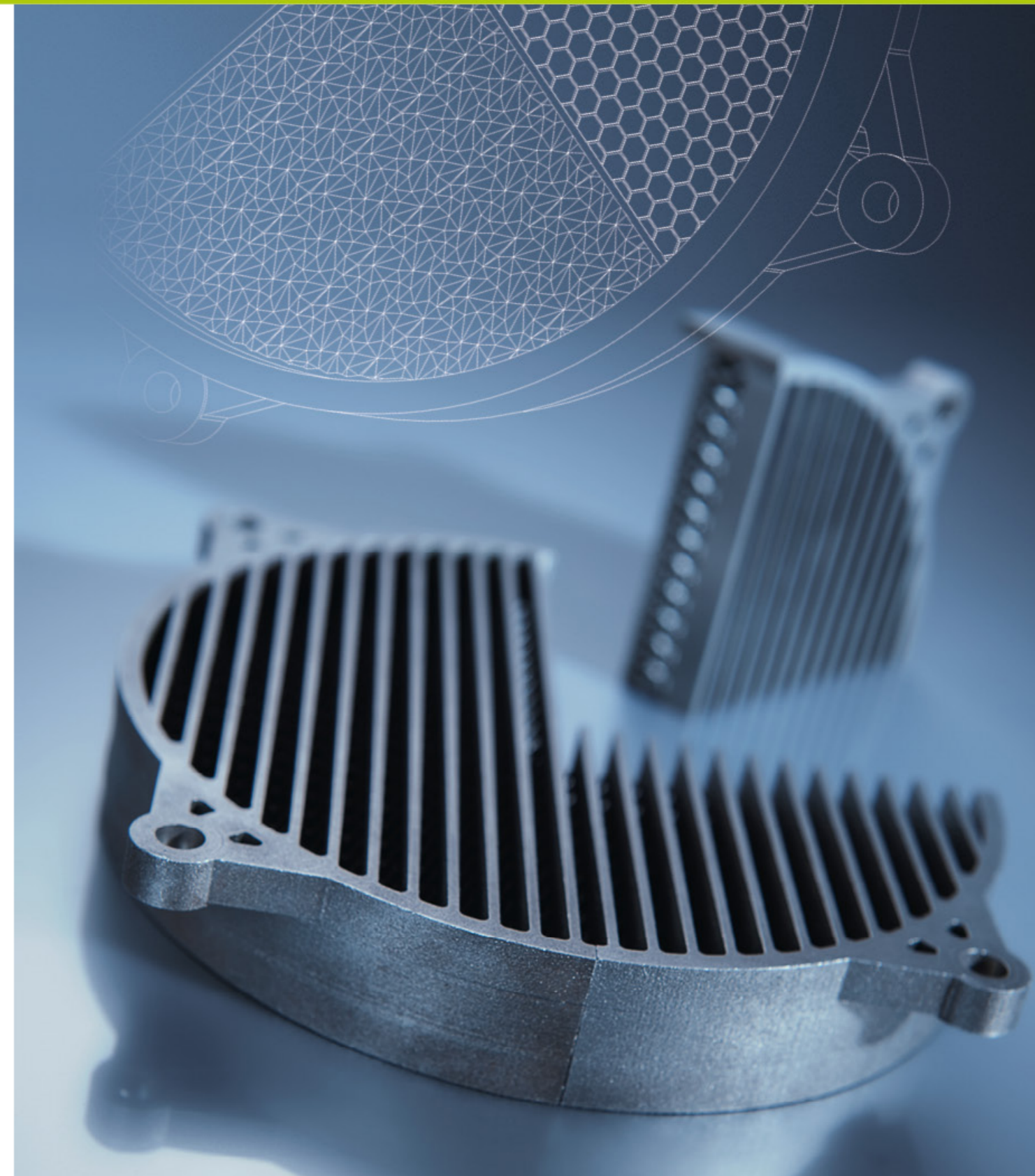
Advice on spare parts management

We offer you comprehensive advice on how to integrate additive manufacturing processes into your spare parts management for flexible spare parts support. In this regard, we analyze the potential for your company, define the targets in conjunction with you, and help you to incorporate the additive manufacturing process into your spare parts management.

- Current/target analysis
- Creation of an individual spare parts strategy
- Agile project management

Further information:

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MATERIAL AND PROCESS QUALIFICATION



LAY THE RIGHT FOUNDATIONS WITH US

Developing new materials for use in additive manufacturing requires extensive experience in the area of process management and material sciences. At Fraunhofer IAPT, we help you to qualify new materials and develop the associated process parameters on the systems that are relevant to you. This allows us to exploit even more fully the potential available to you in terms of application possibilities and material properties, and systematically cater to your individual needs in relation to product specifications.

Process and technology qualification

We can meet your specific qualification requirements in a targeted manner with our machinery, supplied by a wide range of manufacturers. This enables us to qualify alloys in line with your preferred processes or technologies, including for example:

- Selective laser sintering
- Laser beam melting
- Electron beam melting
- Binder jetting
- Laser metal deposition
- Material extrusion (polymers, metal)

- Definition of customer and part requirements
- Comprehensive characterization of the powder material
- Process development on the additive manufacturing system
- Development of adapted support structures
- Verification of material properties on physical parts
- Static and dynamic material testing
- Construction of a demonstrator

The analyses and tests required for qualification are conducted in our specially equipped laboratories. This enables us to guarantee continuous qualification and fast evaluation.

Analysis and powder characterization

When it comes to quality assurance and certification, in particular, precise knowledge of the material's condition at every stage of the process is indispensable, which is why we also provide a comprehensive analysis of the powder material alongside the process development. The development and definition of a suitable specification forms the basis of a stable manufacturing process and high-quality parts. The aim is to examine the material in line with the requirements relating to the various additive manufacturing methods. In this regard, we perform the following tasks, among others:

- Determining the chemical composition
- Analyzing the rheological properties
- Measuring the particle size distribution and morphology
- Further customer-specific parameters can be defined on request (including particle porosity, absorption factor, and water content)
- Defining a specification

We devise the operating procedure, helping you to adapt the process for mass production.

Powder workshop

Our powder workshop gives you a comprehensive understanding of the various powder materials. Besides presenting the differences between the various powder manufacturing processes, the workshop also examines powder quality requirements for the additive manufacturing process. Correspondingly, we look at the most important analysis and measurement methods needed for comprehensive characterization. There is a particular focus on the subject of safety when handling hazardous powder. In addition to the basic safety requirements, further measures are presented so that the materials are safely handled throughout the entire production process.

Customer-specific process development

Target values are defined at the start of any process development, based on the corresponding part requirements; these in turn form the basis of the qualification. For example, process parameters with a high build rate can be developed for increased productivity, or exposure parameters for preferred surface qualities in conjunction with optimized mechanical properties. Process development takes place over several stages as follows:

Examples of materials for industrial use

Metals:

- Aluminum alloys
- Stainless steel and tool steel
- Titanium alloys
- High-temperature and special alloys

Polymers:

- Standard thermoplastics
- Technical thermoplastics
- High-performance thermoplastics
- Thermoplastic elastomers

Further information:
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REDEFINING INDIVIDUALITY

Our aim is to develop customer-specific parts that are optimized for the relevant processes. In doing so, we not only take into account the actual manufacturing process, but also the upstream and downstream stages of the process. You can count on a shorter development time for your products with the expert knowledge of our engineers. Furthermore, you can avoid iterative loops caused by manufacturing challenges and turn your individual design ideas into reality. Besides complete design and simulation solutions, we also offer you individual consulting projects. Using DfAM principles, we can perfect your products by adapting them to the manufacturing conditions or completely redeveloping them.

Design for additive manufacturing

Our complete solution for your product can provide you with a comprehensive (re)design. This not only includes a design that is suited to the manufacturing process, but also measures to optimize the material distribution, such as topology optimization and bionic design.

- Minimized costs as a result of a new manufacturing process
- Increased efficiency of your product
- Post-processing work in line with your requirements
- Latest software solutions used

Right first time

Our experience enables us to identify risks and challenges associated with the production process and show you solutions that are tailored to your product. Immediately switching existing products to additive manufacturing processes is often ineffective. The time and effort spent on production and post-processing tasks can be significantly reduced by making the right adjustments.

- Adaptation for additive manufacturing processes
- Prevention of production risks
- Examination and recommendation of follow-up processes
- Distortion simulation to rule out aborted processes

Design consulting

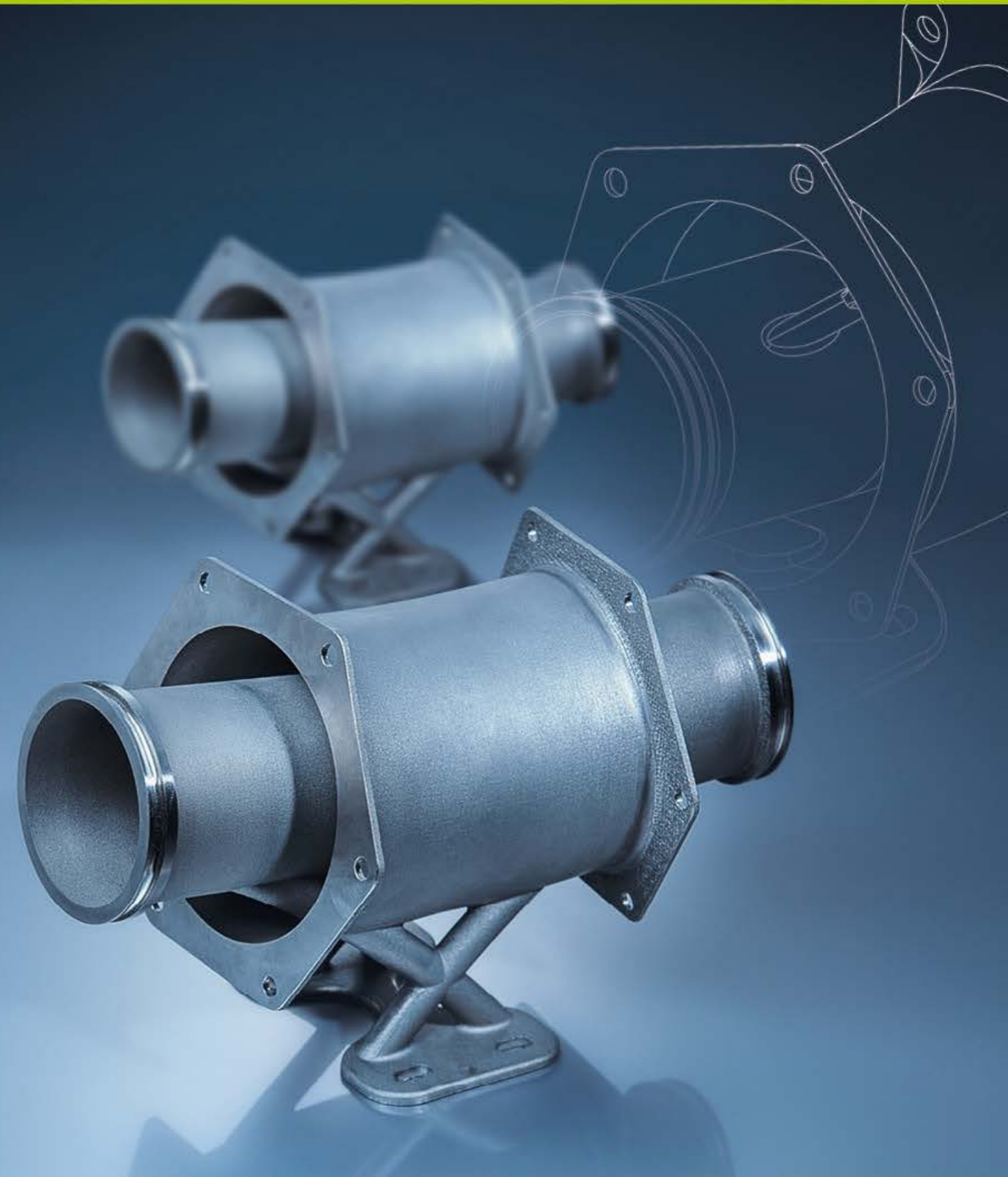
If you prefer to retain full control of your design, but are still unsure about the guidelines or manufacturing conditions, we can show you solutions to overcome these challenges. We get together with you in workshops to work out your future products.

- Examination of the entire process chain
- Potential highlighted and realized
- Concept development
- Feasibility studies
- Consolidation of assembly groups

Individual design solutions

If your particular case is not covered by any of the above-mentioned points, get in touch with us. We can get together with you to come up with the right approach to get you and your product moving in the right direction.

Further information:
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SYSTEM DEVELOPMENT

HOLISTIC AND TARGETED

A good and efficient processing system suitable for industrial applications starts with an individual analysis of your requirements. Besides learning about your processes, this also includes establishing how your new system will be integrated into your manufacturing chain in the future. Our systems undertake a holistic examination of automation in order to fully exploit previously untapped potential.

Fully exploit our expertise

We give you access to market expertise and specialist knowledge in the field of laser material processing and in all areas of additive manufacturing. In short, simply tell us the services you need and we will create the right system for you.

- Analysis of your individual automation task
- Definition of the desired scope of services
- Creation of the necessary product specification documents

Planning and simulation

After establishing which services you wish to take up, we start by planning your manufacturing system. We undertake the entire product development and planning – from the initial idea to the finished machine. Our tools of the trade include complex mathematical and physical analyses, visual and mechanical design, and software-based integration. We use state-of-the-art development environments and manufacturing processes to turn your ideas into reality. Besides being familiar with the classic design methods, we are also experts in designing with voxel-based programs as well as programs suitable for optimizing topology. We use all common laser-based manufacturing processes. When utilizing these approaches, we pay particular attention to additive manufacturing, because this technology offers countless benefits for the development of your system. The design is completed by optimization measures.

Initial samples

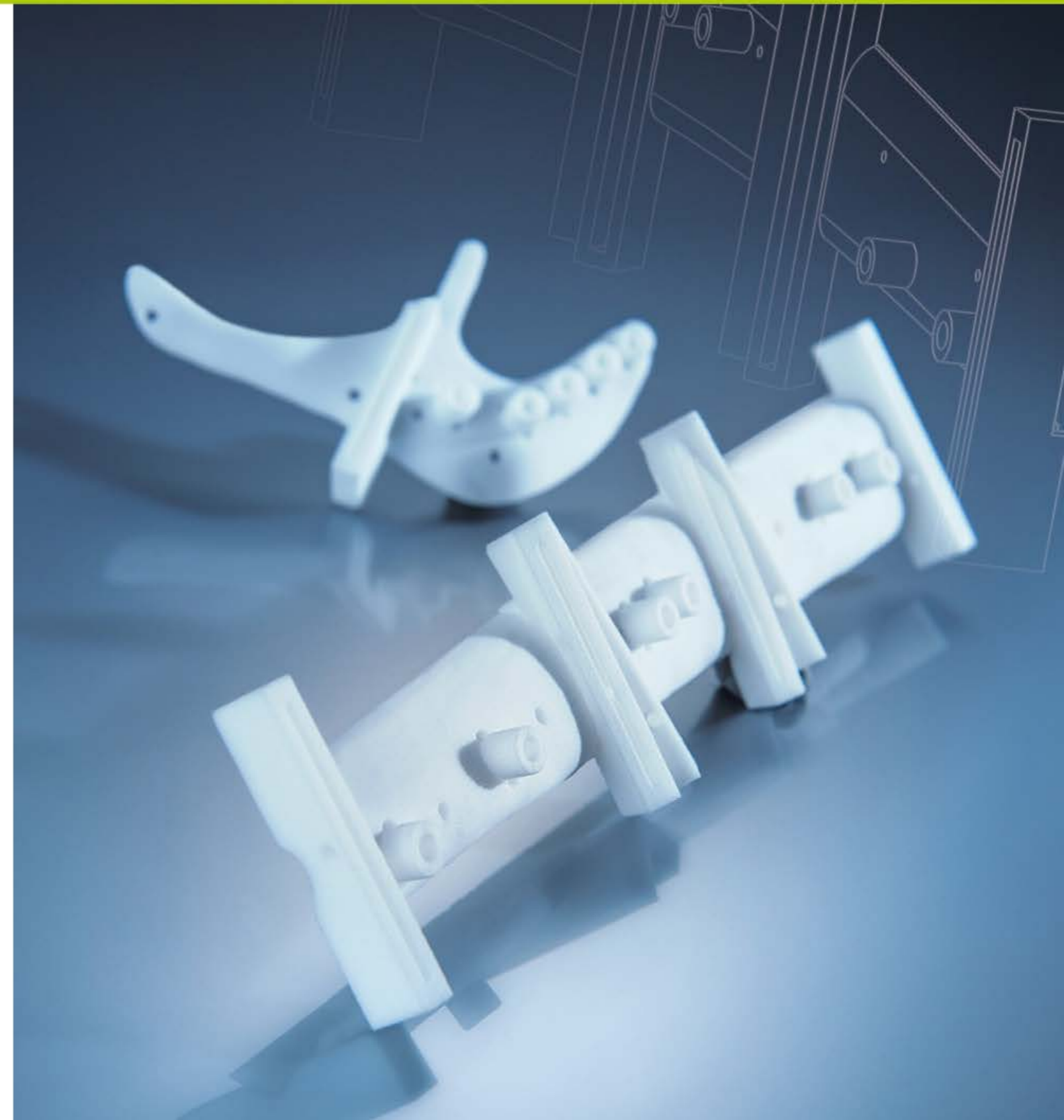
Initial samples are essential for getting a feel of the product and testing all key functions. These samples also serve as a visual aid for you in internal and external consultations. Once approval has been given, the initial sample is produced along with any subsequently developed variations.

For production and final assembly, we have access to cutting, bending, and welding equipment featuring conventional, laser-based, hybrid laser-arc, and powder-based technology. By way of support, our systems feature free-standing and overhead handling systems up to 30 meters long, four meters wide, and three meters high.

Prototypes

An initial series of prototypes is needed in order to fully exploit the potential of your manufacturing operation and facilitate the conversion of the individual production steps into fully autonomous production chains. Once the initial sample has been tested, we can manufacture this initial series for you at your premises or within our test environment. Our systems undertake a holistic examination of automation and provide you with a one-stop shop.

Further information:
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FACTORY PLANNING

FROM A SINGLE MACHINE TO AN ENTIRE FACTORY

In times of digitalized production, you will remain competitive by using additive manufacturing processes for mass producing your goods. By integrating these performance-enhancing processes within an existing manufacturing environment and building entire 3D printing factories from scratch, your company will be taking a forward-looking step. Our range of services enables the best possible integration with your business model using individual analysis and simulation. This may involve the integration of a single machine or the planning of an entire factory.

Individual production analysis

Factory planning starts with an individual analysis of your business model, taking into account existing plant and production figures. This is followed by an evaluation of the horizontal and vertical process chains.

- Analysis of additive manufacturing processes suited to your business model and range of parts
- Integration of 3D printing systems into your process chain
- Blueprint for an individual factory structure

Factory simulation

We use the simulation to create a realistic model of your production environment. This gives us valuable insights into how the utilization capacity of machinery can be increased, for example, or how efficiency can be maximized. At the same time, we evaluate different layouts in order to determine the one that suits you best. Deliverables can include:

- Simulation model for (additive) manufacturing
- Optimized production for the relevant business model
- Catalog of requirements for the production operation, incl. machinery and space needed
- Optimization of the throughput time

Realization

Setting up an additive manufacturing operation is complex, which is why we support you during both the implementation and the start of production. The systems and the necessary peripheral equipment are set up in line with the insights gained from the simulation and in compliance with the high HSEQ standards for additive manufacturing.

Process optimization

Continuous optimization of the production operation is indispensable for fully exploiting the potential of 3D printing. We analyze your operative processes with a focus on pre-process, in-process, and post-process waste. We then conduct an analysis of the current/target status in order to develop optimal layouts tailored to your needs with an improved ROI.

- Identification and reduction of cost drivers
- Sustainable savings and efficiency improvements
- Throughput time minimization
- Material flow and travel path optimization
- Value stream analysis

Further information:

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AN ASSURED ADVANTAGE

We possess extensive expertise in the area of industrial quality assurance. Our specialists embed the latest cross-industry research insights into their qualification methods, enabling us to advise companies on matters beyond the current technological environment and prepare them for future challenges. Our core competency lies in our ability to make concise, industry-related quality statements from the seemingly infinite amount of 3D process data generated. We correlate these with the relevant quality standards. This enables us to make reliable statements on the entire additive manufacturing process – from the design to the system and the part – and guarantee the future reproducibility of the part properties when mass produced using the additive manufacturing process.

In-process control

We develop advanced sensor systems and data analysis methods that can be used to make statements about the critical quality-related properties of your part during the generation process. As a result, the downstream quality control stage is no longer necessary and the entire manufacturing process can be significantly accelerated and secured on a lasting basis.

In-line quality assurance

There is far more to additive manufacturing than simply producing the actual part. Pioneering measurement technology makes it possible to detect and quantify manufacturing defects within the process. We develop reliable and efficient quality assurance methods for you along the entire process chain. These include testing the suitability of the powder, monitoring the process, and taking into account the latest standards in your specific industry.

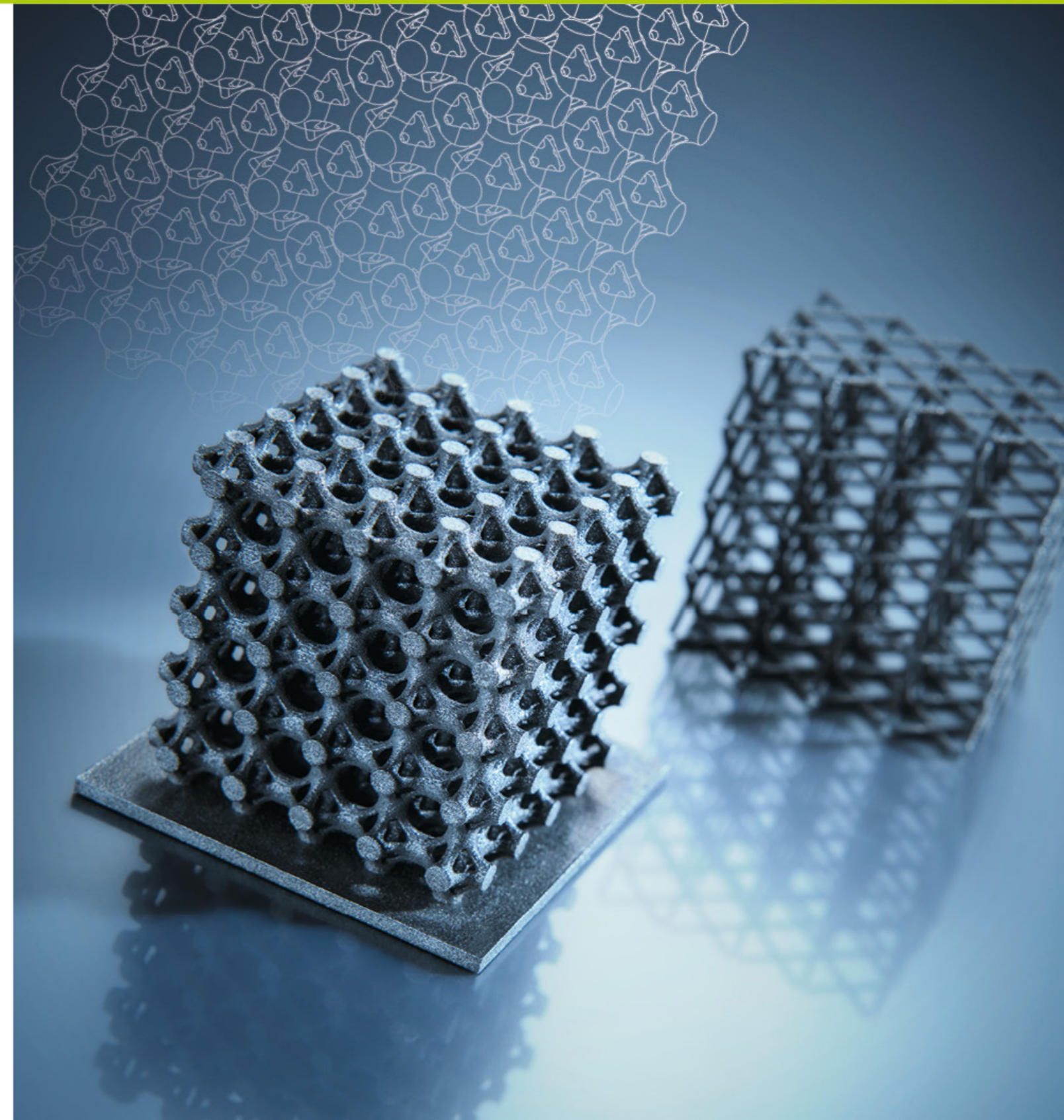
We can use density analyses and a μ CT scan to evaluate the part's internal quality, for example, and examine innovative building strategies and materials. In addition, we can test the fatigue strength and metal structure of your parts, thereby qualifying the capacity of the entire process chain.

Qualification

Additive manufacturing is a highly complex process with well in excess of 100 different factors that can influence processes. Standardization committees are currently working hard to develop standards adapted to additive manufacturing. We support you throughout this process and ensure that the operations within your company are compliant. Here we focus on an industry-specific solution. In aircraft construction, for instance, the fatigue strength is the most important aspect, while in the medical sector it is cleanliness and biocompatibility that matter most, and in the automotive industry crash-related requirements take precedence.

Critical factors can be identified by applying the Six Sigma methodology as an effective tool. The quality of your parts can be systematically improved and checked by monitoring and optimizing these factors.

Further information:
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INDUSTRY WORKING GROUP

THE ADDITIVE ALLIANCE

The Additive Alliance is our cross-sector industry working group for additive manufacturing. At regular network meetings we promote the sharing of knowledge between all stakeholders so that we can play a key role in shaping the future of industry through long-term cooperation partnerships. As such, the Additive Alliance is more than just a network.

Our mission

We want to bring together those who belong together: users and suppliers, researchers and developers, visionaries and realists. In doing so, we think and work across all industries to combine experience from the individual sectors. In this regard, it is important to us to work with you to confront the challenges associated with 3D printing.

- We work together to find the right approaches to solving problems
- We think in terms of dynamic networks rather than individual industries
- We break down barriers and highlight opportunities

Who is the Alliance for?

It is for anyone who wishes to take a decisive step towards an additive future with their company and is seeking a dynamic network to do so:

- Innovators, visionaries, and networkers
- Engineers, designers, businesspeople, and managers
- Cross-sector: automotive, medical, machinery and tooling, ship and rail, polymers, and aerospace

Benefit from...

- ... relevant contacts from a wide range of business and research areas.
- ... inspiring talks in an appealing atmosphere, presentations with industry relevance, specialist workshops, and the resulting cooperation partnerships.
- ... the opportunity to help actively shape research and development.
- ... additive manufacturing experts in various disciplines at Fraunhofer IAPT.

Why Fraunhofer IAPT?

As a member of the internationally active Fraunhofer community, Fraunhofer IAPT possesses broad knowledge and extensive experience in the field of additive manufacturing. The research institution aims for nothing less than to grasp the different production technologies and understand the general environment of additive manufacturing in order to drive forward and significantly influence the industrialization of 3D printing.

Further information:

iapt.fraunhofer.de/en/additive-alliance



TRAINING

THE ADDITIVE ACADEMY

The Additive Academy teaches application-based knowledge on subjects related to additive manufacturing in industrial settings. Take advantage of the comprehensive expertise of the leading research institute in additive manufacturing technologies. Our training program helps you to identify opportunities and challenges associated with this innovative production technology and successfully integrate it into your own company.

The Fraunhofer IAPT Additive Academy is the number one choice for training in the area of additive manufacturing.

- Learn all the relevant content in the area of additive manufacturing within a short space of time
- Understand the limitations of additive manufacturing technologies to minimize potential cost drivers
- Benefit from our hands-on training on the machines to prepare your employees for additive manufacturing
- Find out how to use the relevant software and hardware from the perspective of a neutral user
- We empower you to think from an additive angle, opening up new prospects for product design
- You can discover a real pioneering spirit for your company using the latest research
- Recognize and understand the benefits of additive manufacturing for your company and gain a significant competitive advantage as a result

Our comprehensive seminar program provides suitable training and workshop content for various company areas, including production, management, and design. In all areas, we distinguish between various levels: basic, advanced, and expert.



Why not also take advantage of our workshops, which are individually tailored to your needs? On request, we can even run them at your company. Benefit from first-hand practical knowledge.

Talk to our experts. They will help you to unlock the potential of additive manufacturing within your company and successfully integrate 3D printing.

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Further information: additive-academy.com



Imprint

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