

# Exentis Group

Industrialized  
Additive  
Manufacturing



**exentis**  
**group**  
Industrialized  
Additive Manufacturing



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# Dear potential customers,



**Dr. Rolf Bachmann**  
Chief Executive Officer

The unique Exentis technology platform is setting new standards for additive manufacturing. It enables large-scale production of millions of parts with geometries that were previously impossible to realize. This includes for example very small parts with ultra-fine structures as small as 125  $\mu\text{m}$  for channel width, which can be incorporated in larger components with a diameter of up to 400 mm. It is also possible to integrate functions such as cooling structures, for example. A wide range of materials that are available in powder form, like ceramics, metals, polymers, active pharmaceutical ingredients and biomaterials, can be processed.

Exentis Mass Customization<sup>®</sup> technology is a sustainable cold-printing process with minimal energy consumption that leaves no excess material.

Customers from a wide range of industries worldwide appreciate the cost benefits and flexibility of Exentis 3D production systems. Choose innovation too!

Sounds interesting? You will find all necessary information in this brochure. We would be happy to discuss the technology and the Exentis all-in-one package in more detail in a personal meeting. We look forward to getting to know your project more closely and drawing up innovative solutions together.

Your Exentis Group

# Unique, exceptional. Additive Screen Printing technology

Exentis 3D technology permits solutions that were impossible in the past, new part designs and therefore optimized components. Take advantage of these benefits:



## Large-scale industrial manufacturing

5 million applications per year on one production system for ceramics, metals, polymers or 200 million tablets, with a high building rate of up to 10,000 cm<sup>3</sup>/h



## Free choice of materials

Ceramics, metals, polymers, active pharmaceutical ingredients, organic materials, biomaterials. Several materials in one component



## Ultra-fine structures

Channel width from 125 μm, wall thicknesses from 75 μm, surface quality with roughness levels 2 μm



## Optimized part geometries

Hollow structures to reduce weight, for parts with integrated functions, e.g. cooling structures



## Highly flexible production technology

One production system for processing all materials, outstanding processing capability for industrial manufacturing



## Favorable cost/benefit ratio

Lowest production costs, no post-processing needed for components



## Eco-friendly cold printing technology

Low energy consumption through cold printing technology, high material efficiency, only material needed for the component is processed

# Modular structure and flexible. The Exentis production systems

The Exentis production systems have a modular structure and can be flexibly configured to match your needs. Production systems are available for medium-sized series and large-scale production. Each system can also be configured for cleanroom production.

## EX431 | EX431 GMP

- For medium-sized production series
- Cleanroom production as an option

## EX432i | EX432 iflex GMP

- For large-scale manufacturing
- Modular, 1-4 printing towers
- Cleanroom production as an option

## EX434 iflex GMP

With several printing towers for multi-material applications, e.g. in the pharma industry

For training, maintenance, service and support, we offer you a suitable service package.



EX434 iflex GMP production system for cleanroom applications



EX431 production system



Inspecting the printed parts



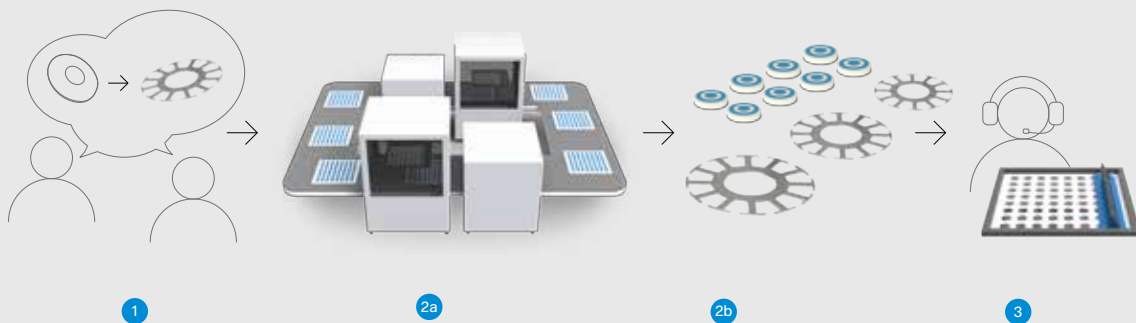
Printed stator sheets

# Matching your needs. The Exentis all-in-one package

The innovative Exentis technology creates many different opportunities for designing components to optimize their functionality and increase cost-effectiveness. We offer an all-in-one package to help you take full advantage of the technology and successfully complete your projects:

- Support in developing optimized parts: project development and production of parts
- Exentis production systems with individual exclusivity to protect your field of applications
- Knowhow, maintenance, service and support
- Material pastes and screens
- Contract manufacturing of parts

## From project development to your own Exentis production system



- 1 Project development, initial manufacturing and decision
- 2a Purchase of a production system with an all-in-one package
- 2b Or contract manufacturing of parts
- 3 Knowhow, maintenance, service, support, material pastes and screens

# High precision, layer by layer. The printing process

## The printing process

Exentis 3D technology is based on the traditional, high-precision screen printing process, which Exentis has extended to the third dimension. When printing, the material in paste form is pressed through a screen on to a workpiece carrier, layer by layer, until the parts have reached their final height. The screens determine the parts' shape.

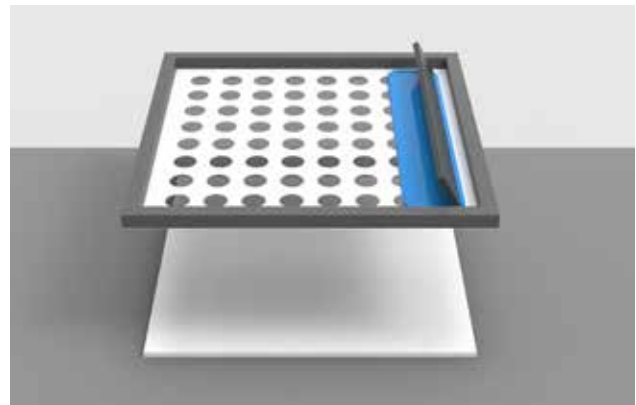
The printing process is fully automatic with a cycle time of only two to eight seconds. Depending on the number of parts on a workpiece carrier, series with millions of parts can be printed on just one production system. "Retooling" from one component to another takes just a few minutes.

## Screens and material pastes

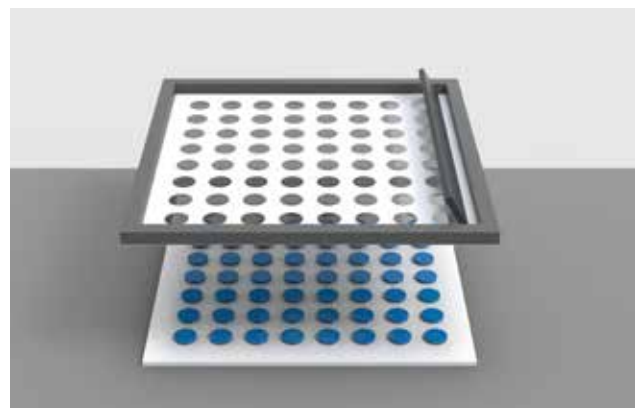
We manufacture the screens within 48 hours. Elaborate and expensive tools and molds, like those used for conventional processes, are not required.

Almost any material which is available in powder form can be processed into a printable paste. The high expertise of our material experts allows us to develop pastes for even the most unusual materials.

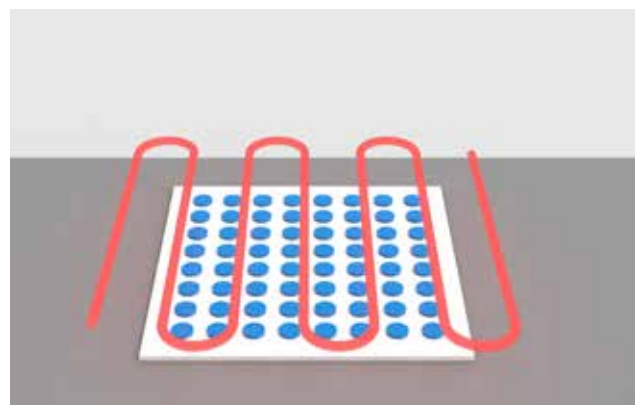
Another advantage of the paste system for pharmaceutical applications is that the production systems can be more quickly cleaned, retooled and prepared for another application, as there is no contamination from powder dust.



Flooding the screen with material paste



Printing a layer



Drying the parts

# Innovative technology countless application possibilities for various industries

## New Energy: Microfilters Ultra-fine channels improve the filtering process



Microfilter with 211 ultra-fine channels, part Ø 3.5 x 0.55 mm



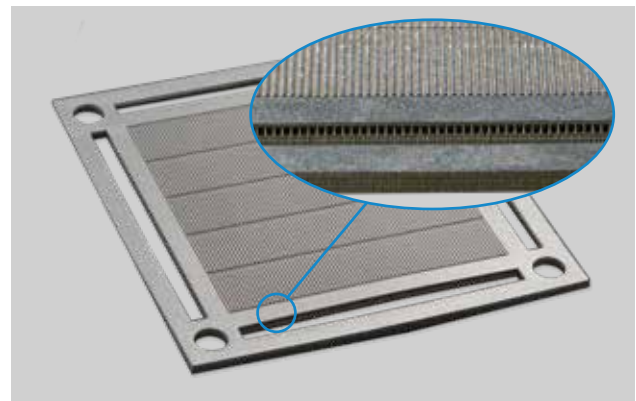
### Application / the challenge:

Microfilters are used in exhaust aftertreatment systems in cars. They remove impurities and particles from the emission control fluid. Traditionally manufactured filters are made of mesh, that might fray and fail to filter the smallest particles.

### Solution:

Exentis technology enables the production of ultra-fine filters with greater strength. There is no mesh that might fray over time. This results in longer part-lifespan and better filter quality. The customer benefits from optimized parts and high production capacity.

## New Energy: Electrolyzer plate Integrated filter structures for optimized performance



Electrolyzer plate with integrated filter structures



### Application / the challenge:

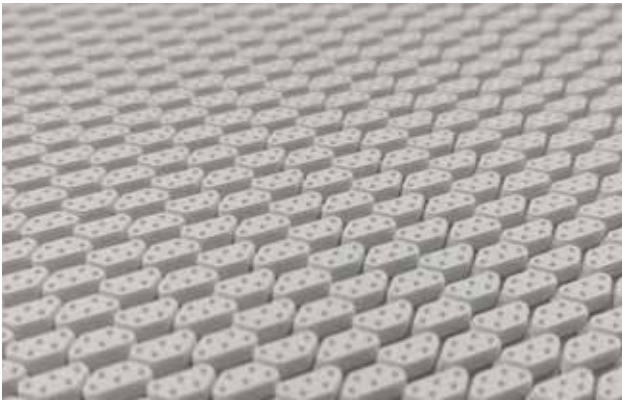
The Electrolyzer plate filters ammonia residue in a membrane module after the splitting of ammonia into hydrogen and nitrogen. The filtered hydrogen will be used as fuel for vehicles. The goal was to find an innovative and cost-effective production technology for this part.

### Solution:

With Exentis technology, the filter structure can be seamlessly integrated into the part. Thanks to the high surface quality after printing, no post-processing is required. In a 24-hour shift, 1,050 components can be manufactured. These factors enable low production costs.

→ For further examples see: [www.exentis-group.com](http://www.exentis-group.com)

### MedTech: Ceramic wireguides More cost-efficient production, no need for tooling or post-processing



Ceramic wireguides for heart pacemakers



#### Application / the challenge:

Ceramic wireguides with a high hermetic seal are inserted into heart pacemakers. Expensive tool molds were needed to manufacture the ceramic parts when using traditional technologies. The parts also had to be post-processed to meet the quality requirements.

#### Solution:

Using Exentis technology, the customer can save costs as no expensive tools and no post-processing are required. The additive series manufacturing in GMP quality is much more efficient and more sustainable and is therefore the more cost-efficient process for the customer.

### Pharma: Tablets Tablets with flexible release profile for active pharmaceutical ingredients



Tablets with individual release profile for the active ingredient



#### Application / the challenge:

Conventional technologies are limited in their ability to produce controlled release profiles using multiple active pharmaceutical ingredients in one tablet.

#### Solution:

With Exentis technology, a combination of multiple active pharmaceutical ingredients and excipients with defined structures in one tablet is possible. This enables a staggered release. Patients with Parkinson's disease, for example, benefit because they no longer have to get up at night to take a tablet. Taken in the evening, the active ingredient is released at the optimal time and reduces stiff muscles and joints in the morning. Pharmaceutical manufacturers and patients benefit from application-optimized tablets.

## A practical example

Exentis technology is used around the world and often provides our customers with crucial benefits. As a result, we are often unable to disclose details. However, there is one statement we would like to share with you. A company in Germany that operates in the energy sector has this to say:

“We are using the EX432i Exentis production system. Thanks to the innovative 3D screen printing technology, we have been able to optimize the shape of a part that is important for us. For the first time, we can integrate cooling channels with diameters of just a few micrometers into the part in a single production

step. By purposefully optimizing the geometry, the part is now much thinner and lighter, far beyond what would have been possible using traditional technologies.

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„Exentis technology provides us with significant competitive advantages.“

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This gives us significant competitive advantages in the marketplace. We are very pleased with the results we have achieved and value our partnership with Exentis.“



Ideal for innovative technologies: Exentis 3D Screen Printing



Screen with bipolar plates ready for printing on EX432i production system



Exentis development and final assembly site at Malterdingen, Germany

# Material portfolio for industrial parts

Do you need millions of parts made from stainless steel, aluminum oxide or silicon carbide? Or space-aged titanium? Additive Screen Printing processes any material you need. From metals, ceramics, graphite, polymers, and alloys to porous materials and many more.

Materials that are particularly well-suited for Additive Screen Printing include:

## Metals and metal alloys

Iron-based alloys, Fe-based alloys

- Stainless steel 316L/1.4404
- Quench & tempered steel 42CrMo4/1.7225
- Soft magnetic materials  $\text{FeSi}_{5.5}$

Copper alloys, Cu-based alloys

- Cu ETP/2.0065

Aluminum alloys, Al-based alloys

- Aluminum Al6061/AlMg1SiCu/3.3214

## Technical ceramics, advanced ceramic materials

- Aluminum oxide, Alumina /  $\text{Al}_2\text{O}_3$
- Zirconium oxide, Zirconia /  $\text{ZrO}_2$
- Silicon carbide / SiC
- Aluminum nitride / AlN
- Barium titanate /  $\text{BaTiO}_3$

## Other materials for Additive Screen Printing

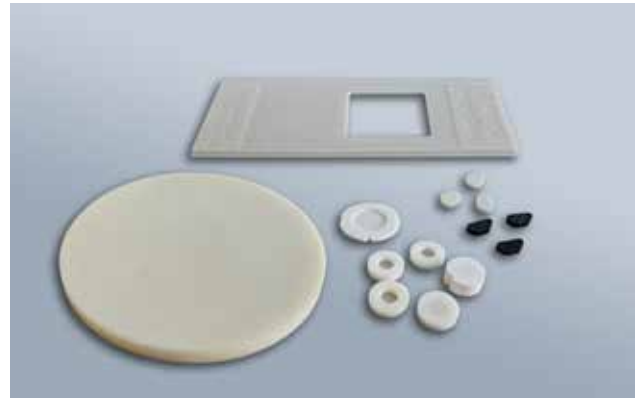
- Graphite
- Epoxy (UV-cured)

## Custom materials and porous materials

Since we develop the pastes for additive mass manufacturing in-house, we can customize materials according to specific requirements. One example: 316L steel with a porosity of up to 50 %.

## Material variety thanks to paste-based additive manufacturing technology

A lot of materials available in powder form can be processed into printable pastes - and ultimately into the desired applications.



Various materials can be processed including stainless steel, copper, technical ceramics and more.

The choice of powder has a significant impact on the properties and the performance of the printed parts. Our experts therefore carefully select the particle shape and size of the materials used to produce the perfect pastes.

This allows for flexible adjustment of porosity, electrical and thermal conductivity, as well as the mechanical properties of the additive manufactured parts.



Printing heating elements on production system EX432i

# Materials for pharmaceutical applications

Additive Screen Printing is a protective cold-printing technology, allowing for the processing of very sensitive materials in a clean room environment, such as:

- Active pharmaceutical ingredients
- Bio-materials
- Active cell cultures

The Exentis cleanroom production systems are flexible and available with several printing towers. This makes it possible to combine up to three active ingredients in a single tablet – even when producing millions of tablets.

Additionally, as the technology uses pastes, there is no powder dust contamination in the production systems. The production process can be quickly switched to process different ingredients as needed.



Additive screen printing enables the incorporation of multiple active pharmaceutical ingredients into tablets



The gentle cold-printing technology enables the processing of active pharmaceutical ingredients



Cleanroom production system EX432iflex GMP with two printing towers

# Global presence.

## Exentis locations and partners

Exentis is an aspiring high-tech corporation with about 130 employees working at five locations. We are a unique mix of specialist skills consisting of screen-printing experts, engineers, material scientists, assembly specialists, developers, programmers, mechanical engineers and sales experts.

Thanks to our comprehensive expertise, we are a reliable partner for our customers in all project phases, whether it is project development, the decision for a production system or the successful implementation of the technology.

Exentis production systems are used by multiple customers and partners around the world.

### Exentis Locations:

#### Stetten, Switzerland

- Head office
- 3D Innovation Center
- Industrial manufacturing of components

#### Malterdingen, Germany

- Development and final assembly of production systems

#### Velden, Germany

- Screen development and production

#### Jena, Germany

- Project development
- Cooperation with local research institutes and universities

#### New York, USA

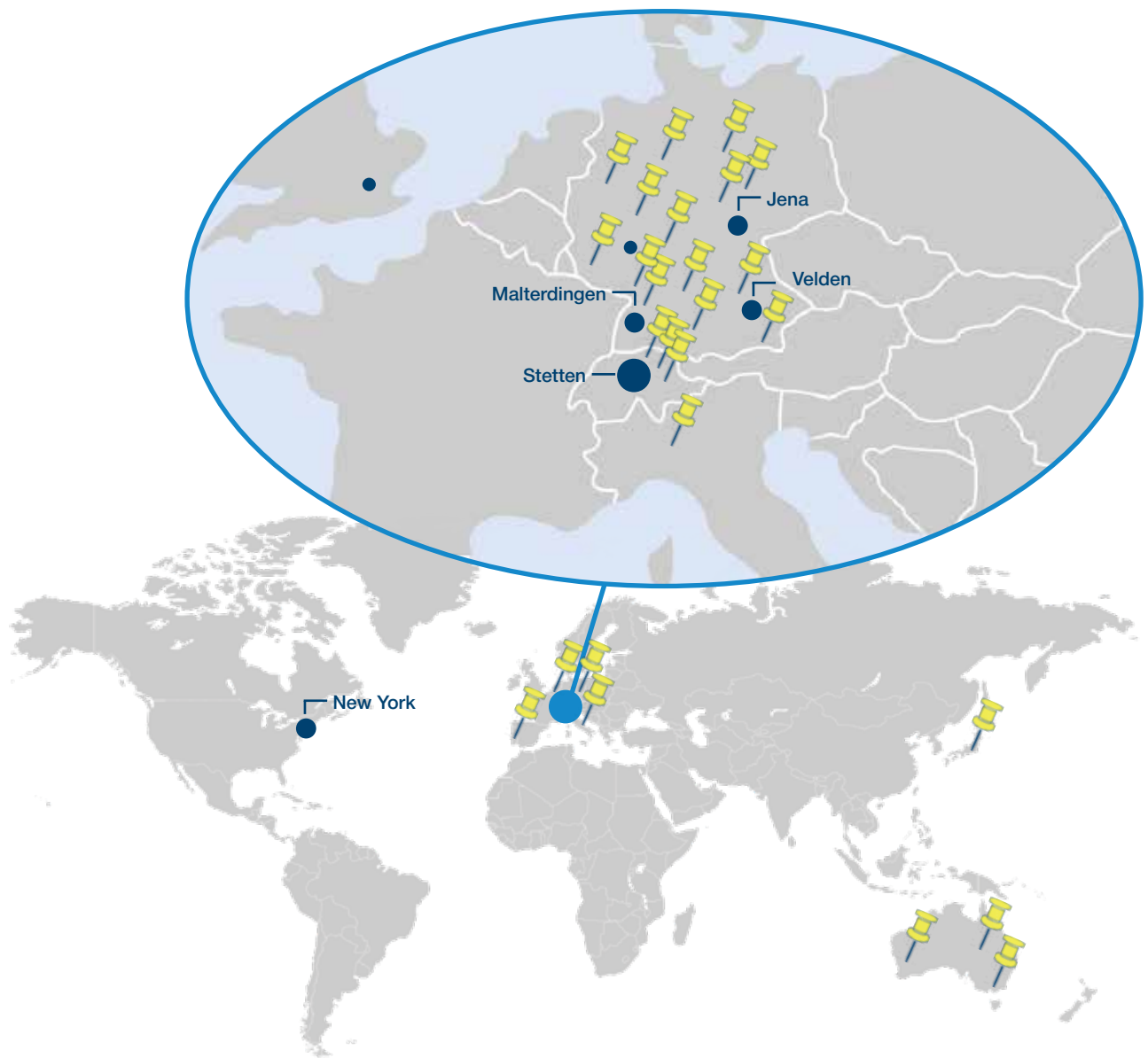
- Head office for North America
- Sales, service and customer services



The material experts Latifa und Noémie developing material pastes



Uwe, Head of Product Management, presents a newly printed application



### Legend

- Head office
- Locations
- Sales representatives
- 📌 Exentis production systems in use at customers' premises



**Feel free to contact us.  
We look forward to your inquiry.**

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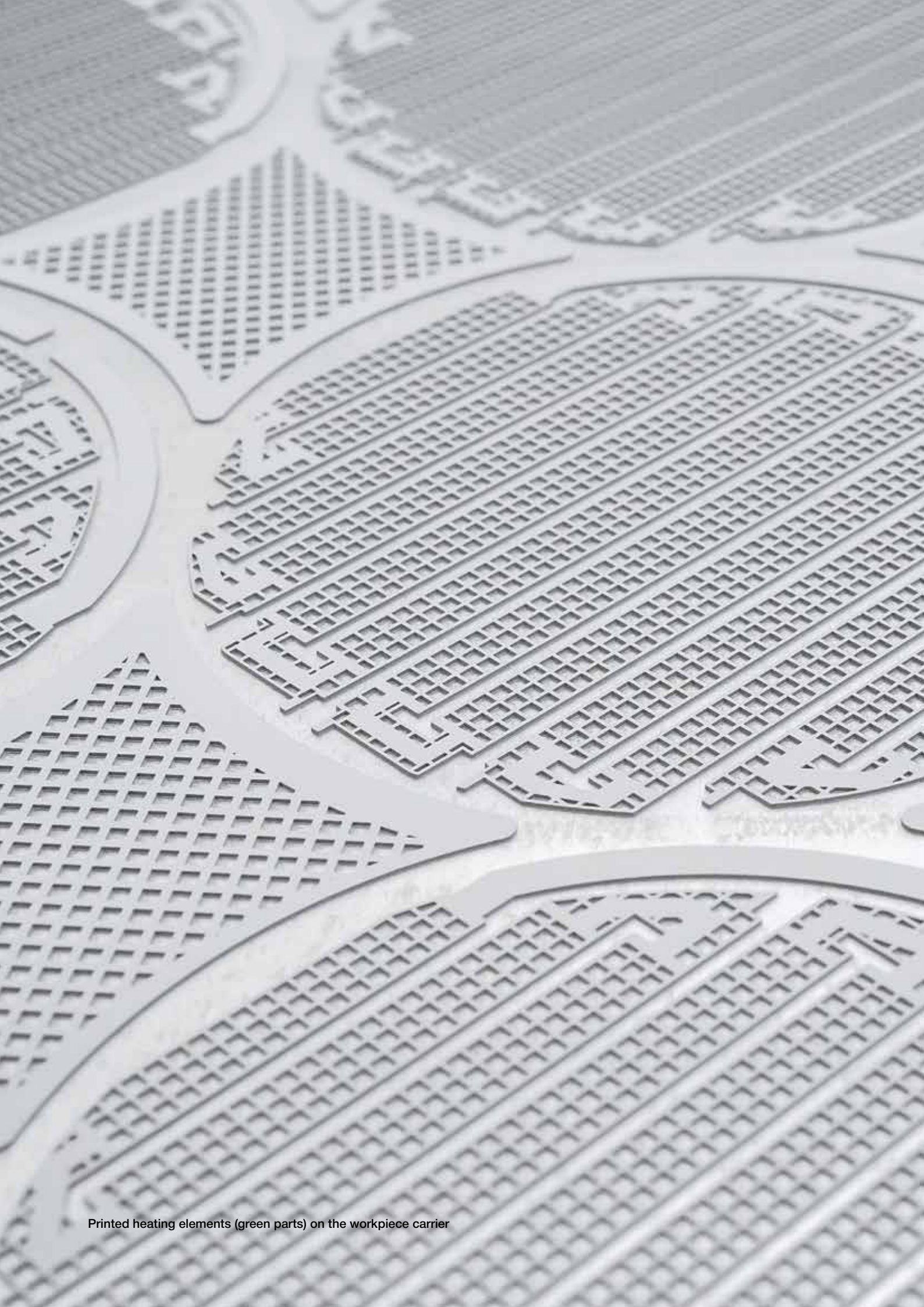


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Printed heating elements (green parts) on the workpiece carrier

# Industrialized Additive Manufacturing

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