

# Additive Manufacturing Solutions



**metal powders**  
**prototyping**  
**series production**

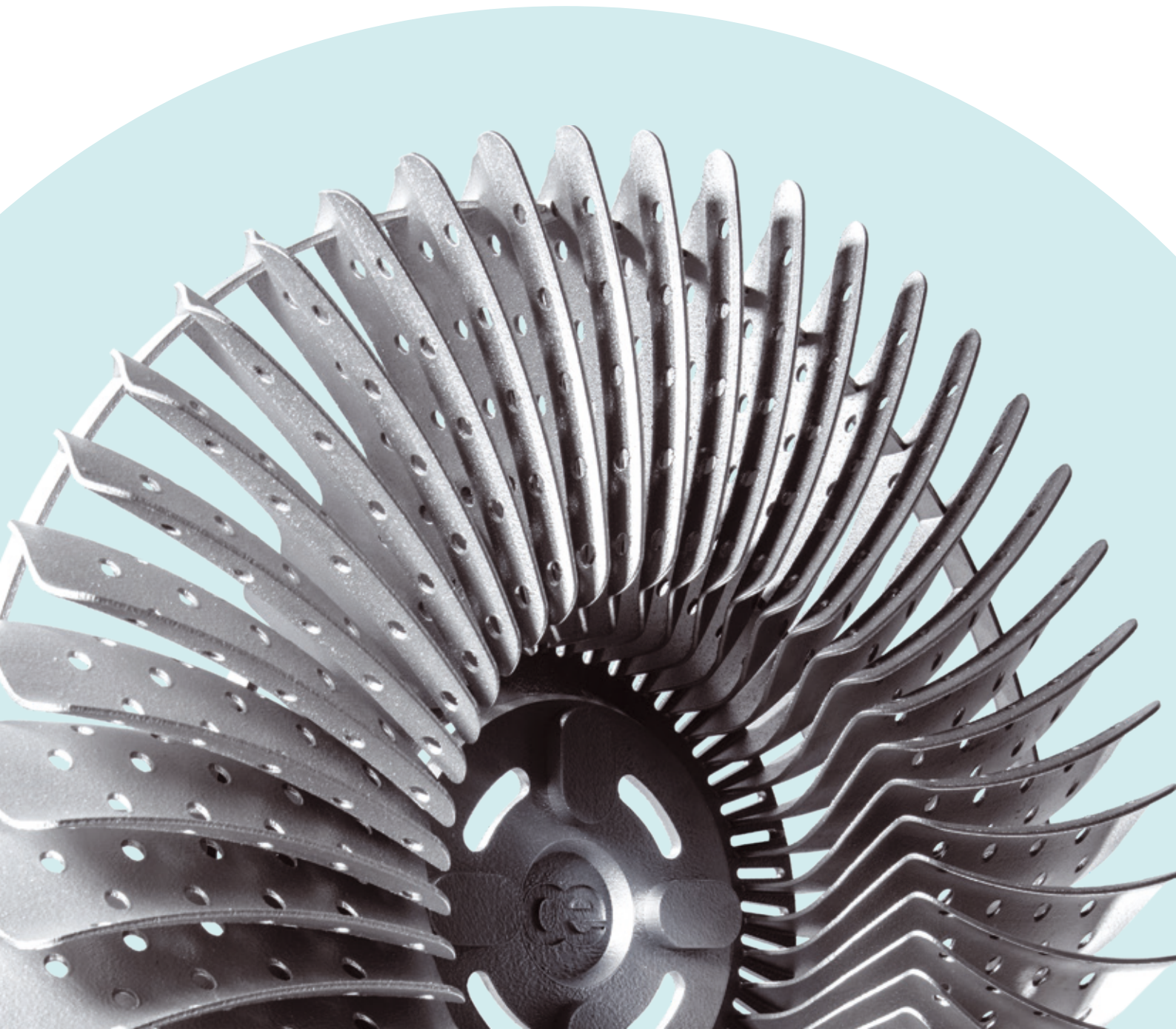


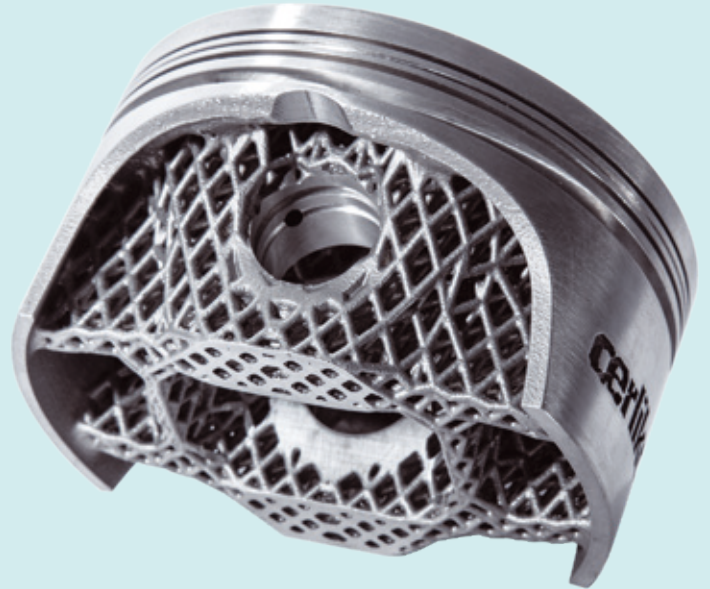
# With additive manufacturing, your greatest challenges now have solutions

Manufacturing companies face intense pressure to reduce demands on finite energy and raw materials, while facing design challenges that become increasingly complex. AM has gone from a valuable tool for prototyping new products into a sustainable, cost-effective mainstream manufacturing process, challenging traditional solutions like casting, forging and machining. It is an entirely new family of processes that has already opened up new possibilities for manufacturers in the demanding aerospace, automotive and medical sectors, amongst others.

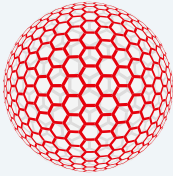
Increased technical complexity from product development teams, increased demands from end users for quality and durability, reduced weight and cost are all making it essential to find new solutions.

Fortunately, advances in AM are making new solutions possible.





## Imagine the manufacturing possibilities



### Enhanced geometric freedom

Formerly complex or impossible geometry becomes simple when design for AM principles guide you in new designs.



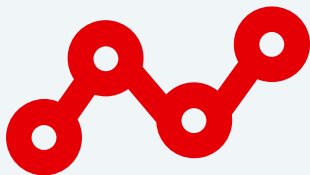
### Fully optimized performance

AM enables you to manufacture designs with less components, lower mass, and added features to optimize performance for each application.



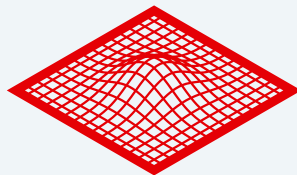
### Shorter innovation cycles

Innovative products can now be designed, tested, and developed more rapidly without delays from expensive tooling and prototype fabrication.



### Shorter supply chain

AM's unrelenting efficiency streamlines production, which allows you to cut supplier, transportation, and warehousing costs.



### Customization made easy

AM's flexibility translates to tailor-made manufacturing at lower unit costs, whether you have small production batches or mass customization of components.



### Driving new business models

AM offers parts built on demand anywhere in the development cycle, enabling shorter time to market and more competitive business models.

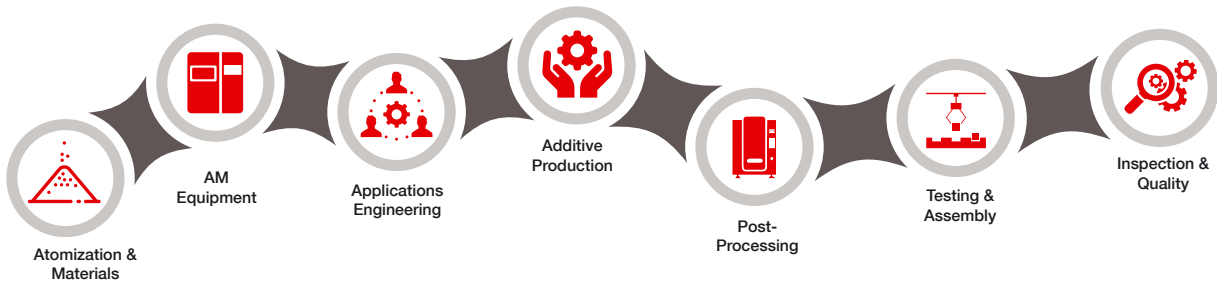


# We stand at the forefront of industrial AM

**At Oerlikon AM, our advantage is clear: we're integrating and scaling the entire AM value chain to handle your project from point A to Z.**

With a broad portfolio of surface technologies and advanced AM tested materials, deep expertise in the design and engineering of industrial, metal-based components, and unparalleled global service network, we are uniquely positioned to advance the industrialization of additive manufacturing.

As part of the Oerlikon Group, a global powerhouse committed to investing in cutting-edge technologies that deliver superior performance and environmental sustainability, we're trusted by some of the biggest names in the manufacturing industry.



## Metal Powders

We have our own high-quality production facilities and a commitment to quality, a growing portfolio of alloys, and an R&D team committed to developing new alloys that are ideally suited to the manufacturing process.

## Additive Component Manufacturing

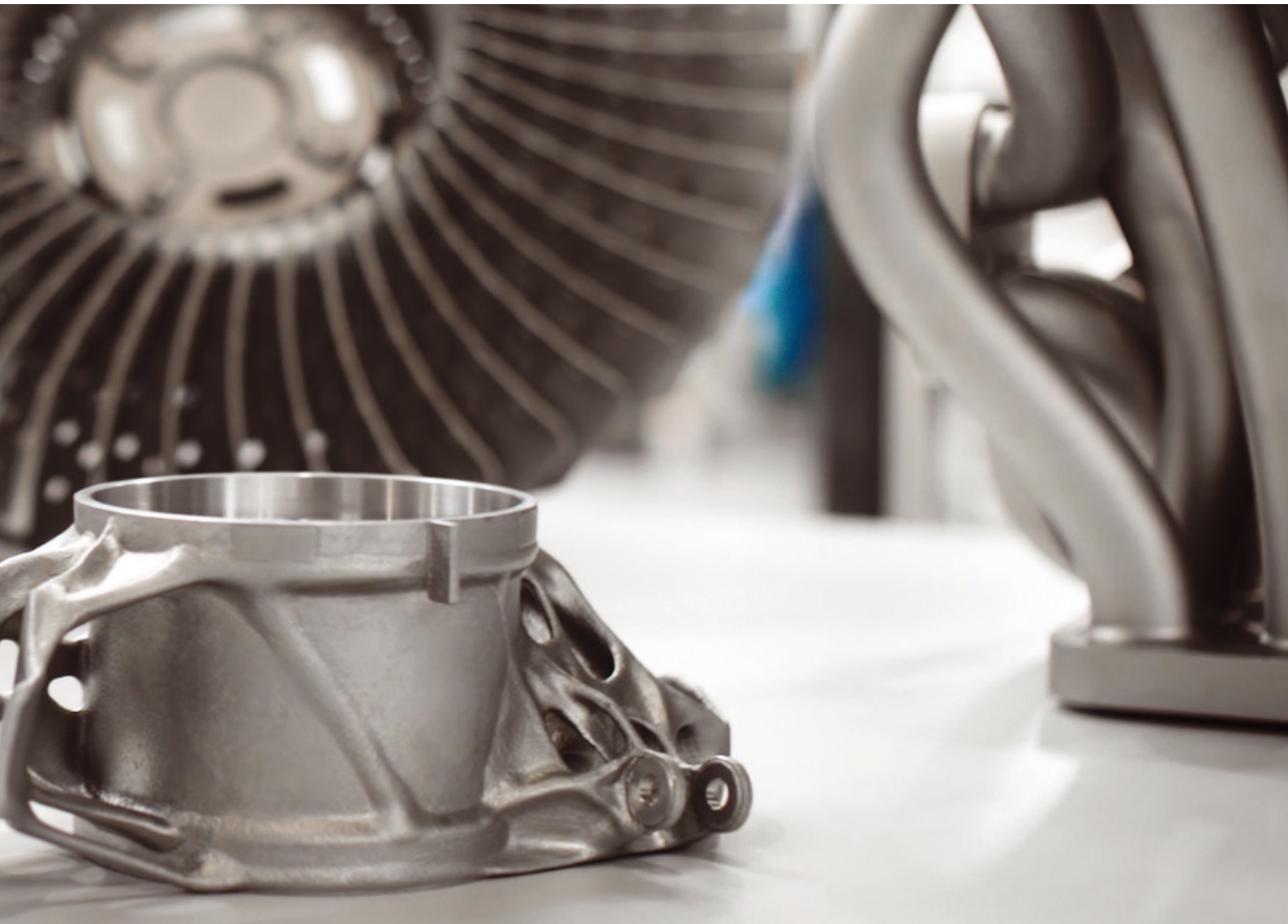
We have helped AM go from a prototyping tool to a sustainable, cost-effective mainstream manufacturing process, challenging traditional solutions. We act as the leading AM research hub for academic and industrial partnerships in the EU and the US.

## Design & Application Engineering

We help our customers overcome design challenges, whatever their industry, and whatever the application. Our design and R&D teams can help turn concepts into a qualified production reality.

## Key Sector Experience

We already work in aerospace, automotive, medical, power generation and tooling – all sectors where precision and quality are vital.



# 80+ years of materials and engineering experience with high performance industrial components

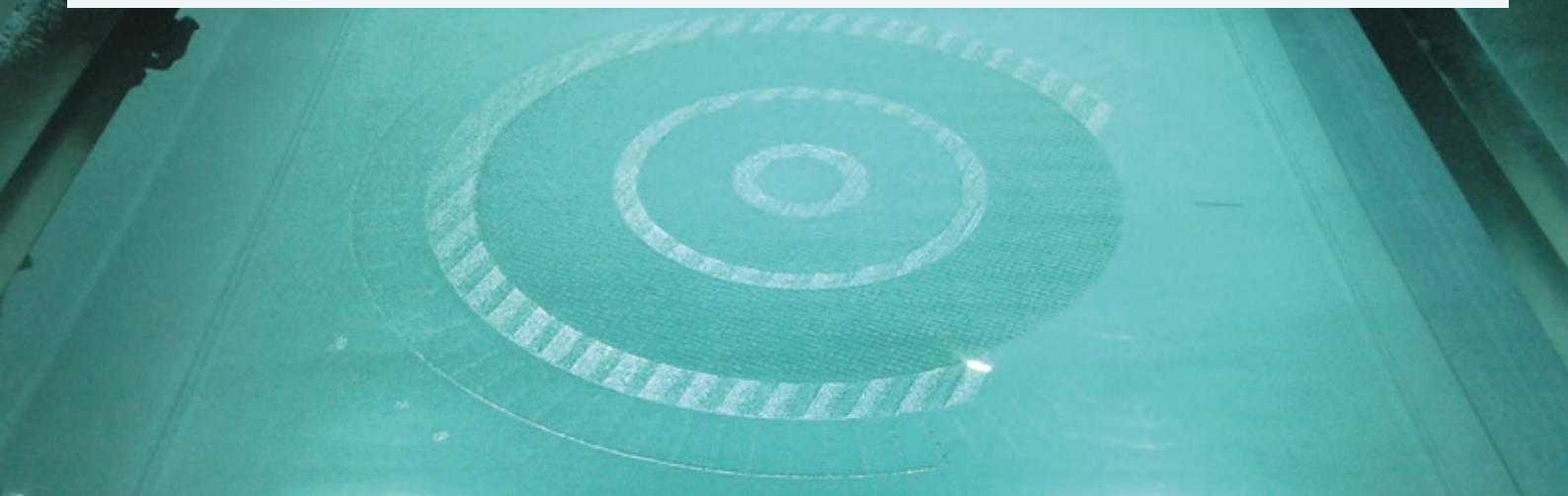
**This foundation enables us to provide the world's leading metal powder portfolio, offering superior quality, traceability and production performance.**

We have a broad range of existing alloys, supported by ongoing development. We also know that current off-the-shelf solutions in AM cannot answer every production need. Our R&D teams can rapidly design, optimize, and produce new and custom alloy chemistries for pilot atomization and AM validation in our production facilities.

## AM Metal Powder Portfolio

	Product	Nominal Chemistry	Nominal Particle Size
Ni-based	MetcoAdd™ 718C / 718E / 718F / 718G	Ni 18Cr 18Fe 5(Nb+Ta) 3Mo 1Ti 0.6Al	-45 +15 / -63 +20 / -106 + 45 / -90 +45
	MetcoAdd™ 738A	Ni 17Cr 7(Al+Ti) 9Co 0.1C 2Mo 1.5Ta 0.06Zr	-45 +15
	MetcoAdd™ 625A / 625E	Ni 21Cr 9Mo 4Fe 4(Nb+Ta) 0.4Al 0.4Ti	-45 +15 / -63 +20
	MetcoAdd™ HX-D	Ni 21Cr 18Fe 9Mo	-45 +15
	MetcoAdd™ H230-A	Ni 22Cr 2Mo 14W 0.35Al 0.03La	-45 +15
Co-based	MetcoAdd™ 75A / 76A / 78A*	Co 28Cr 6Mo	-45 +10 / -45 +15 / -45 +15
	MetcoAdd™ H188-A	Co 22Ni 22Cr 14.5W	-45 +15
	MetcoAdd™ MM509-A	Co 10Ni 24Cr 7W	-45 +15
Fe-based	MetcoAdd™ 316L-A / 316L-D	Fe 18Cr 12Ni 2Mo 0.02C	-45 +15 / -106 +45
	MetcoAdd™ 17-4PH-A / 17-4PH-D	Fe 17Cr 4.5Ni 4Cu 0.3(Nb+Ta) 0.07C	-45 +15 / -106 +45
	MetcoAdd™ 15-5PH-A / 15-5PH-B	Fe 15Cr 4.5Ni 3.5Cu 0.3Nb 0.07C	-45 +15 / -90 +45
	MetcoAdd™ C300-A	Fe 18Ni 9Co 5Mo	-45 +15
	MetcoAdd™ H11-A	Fe 5 Cr 1Mo 1Si 0.5 V 0.4 C	-45 +15
	MetcoAdd™ H13-A/ H13-B	Fe 5Cr 1Mo 1Si 1V 0.4C	-45 +15/ -90 +45
Ti-based	MetcoAdd™ Ti-64 G23-A/ G23-E/ G5-B	Ti-6Al-4V	-45 +15 / -106 +42 / -63 +20

\* Reduced carbon content- appropriate for the manufacture of medical or dental implants using PBF-LB.





## Production Technology and Capabilities

### Troy

- Inert Gas Atomizers (IGA) for Ni, Co and Fe based powders (Nitrogen & Argon atomization gases)
- NADCAP certified QA facility
- Proprietary labeling / packaging capabilities

### Plymouth

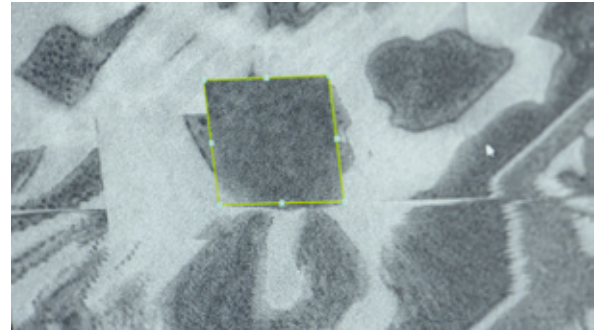
- Vacuum Inert Gas Atomizer (VIGA) for Ni, Co and Fe powders (Nitrogen & Argon atomization gases)
- EIGA for Titanium powders – Grades 5 and 23 (Argon only)
- Dedicated R&D Atomizer: up to 250 kg heat sizes (Argon only)
- Onsite QA capabilities, packaging, and R&D development

### Distribution Centers

- Regionally positioned (Westbury, USA; Kelsterbach, Germany; Singapore; Australia; Shanghai; Nagoya, Japan)
- ISO, OHS certified
- Over 6 million units moved through network

## Metal Powder R&D

- R&D centres (Munich & Charlotte) for testing and process parameter optimization on a variety of metal AM machines.
- Pilot atomizers available for R&D powder development / analysis with up to 500 lb maximum melt capacities. Oerlikon Scoperta provides computational Rapid Alloy Development (RAD) tools to create new alloys and improve existing alloys.



# Ultimately, if you can imagine it, we can build it

**From rapid prototyping to small or large volume series production, we have the capacity to meet your needs. Whether you're seeking an integrated full-service provider, or a production partner, our expertise— and extensive AM equipment options — can help you achieve the end functionality, geometric accuracy, and final mechanical characteristics your application demands.**

With application engineers based in the EU and the US, we're an in-house design shop that delivers swift response and design times, as well as the agility needed to work with a wide range of design files and equipment. These capabilities, when combined with our experienced R&D team, allows us to advise you on the best possible combination of materials, design, production methods, and post-processing for your project.

## Prototyping

Oerlikon AM provides a broad range of material and machine options to suit the needs of each prototyping application. We specialize in rapid prototyping of end-use components in metals, polymer, and ceramics.

## Series Production

We stand ready to guide you through the process of moving from prototyping to production.

At Oerlikon AM we make series production components for many industries, including aerospace, medical, power generation and automotive.

## Conventional Manufacturing Technologies

Not all parts are made for AM. This is why our Applications Engineering teams help customers select from the best available manufacturing technologies within the portfolio.

- Sand/ Precision Casting
- Die Casting
- HSC/CNC Milling
- Injection Molding
- Elastic Components

## Design & Applications Engineering

Our expertise is such that we can help our customers overcome even the most demanding design needs, whatever their industry, and whatever the application. We provide the expertise to select the right process, machine, and material to make parts manufacturable.

## Post-Processing

Our complete unique in-house capacity includes Post-Processing and expertise in surface engineering with both thin and thick film coatings and final processing. Hot Isostatic Pressing, vacuum heat treatment, CNC machining, surface finishing, and metallurgical evaluation enable us to provide finished parts.





## AM Metal Production

EU / USA

### Materials

**Al** AlSi9Cu3, AlSi7Mg, AlSi10Mg, AlMgSc (Scalmalloy), 6061 RAM 2<sup>(US)</sup>, A205<sup>(US)</sup>

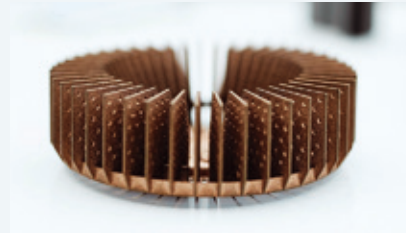
**Ni** Alloy 718 (2.4668), Alloy 625 (2.4856), Alloy X (2.4665), Alloy 230<sup>(US)</sup> Haynes 282

**Co** CoCrMo (F75)

**Fe** 18 Ni Maraging Steel (1.2709), 316L (1.4404), 17-4PH (1.4542), 1.4859, 1.4308 (CF8), H11 (1.2343)<sup>(US)</sup>, H13 (1.2344)

**Ti** Ti-6Al-4V

**Cu** CuNi2SiCr<sup>(EU)</sup>

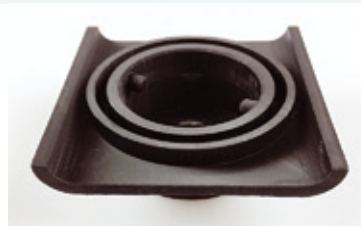


### Laser Powder Bed Fusion of Metals (PBF-LB/M) also known as SLM & Electron Powder Bed Fusion of Metals (PBF-EB) also known as EBM

<b>Arcam</b>	1x Arcam Q20+	4x Arcam Q10+	2x Arcam Q10	
<b>Concept Laser</b>	1x Concept Laser M2 (1kW)	4x Concept Laser M2 Dual UP1 (2x 400W)		
<b>EOS</b>	1x EOS M270 (200 W)	3x EOS M280 (400W)	12x EOS M290 (400 W)	7x EOS M400 (1kW)
<b>SLM Solutions</b>	3x SLM280HL (400W)	1x SLM280HL (2x 400W)	1x SLM 125HL (400 W)	
<b>Renishaw</b>	1x RenAM 400HT (400 W)	1x RenAM 500Q (4x 500 W)		
<b>Trumpf</b>	4x Trumpf TruPrint 1000 (200W)	3x Trumpf TruPrint 3000 (500W)		
<b>3D Systems</b>	2x ProX DMP320 (500 W)	2x DMP Flex 350 (500W)		

## AM Polymer Production

EU



### Laser Powder Bed Fusion of Polymers (PBF-LB/P) also known as SLS

**EOS** 1x EOS P100 1x EOS P110 1x EOS P390 2x EOS P396

**Materials:** PA12, PA12-GB, PA12-CF, PA12-AI (Alumide™) and TPU

### Vat Photopolymerization (VPP) also known as CLIP

**Carbon** 3x Carbon M2

**Materials:** EPU40 (similar to TPU), RPU70 (similar to ABS), CE221 (similar to glass filled nylon), UMA90 (similar to stereolithography resins), SIL30 (similar to TPE and EPX82 (similar to 20% glass filled PBT)

# Aerospace

Making aircraft safer, lighter and more efficient. The Aerospace industry requires quality, traceability, affordability, reliability, and to optimize weight and performance. AM can deliver on all those metrics in a cost competitive framework.

ALM PUSM bracket ©RUAG

Sentinel 1 Antenna bracket ©RUAG

Turbopump © Rocket Factory Augsburg

LENA Space nozzles for rocket steam turbine

LENA Space stator vane section

Astrium Ariane 5 ME Launcher valve ©Airbus Defence & Space

LENA Space stator vanes for rocket steam turbine

LENA Space casing for rocket turbopump

LENA Space impeller for rocket turbopump

LENA Space rocket nozzle

LENA Space rotor for steam turbine

RF horn

Aero engine boroscope boss made from **Ni-based alloy 718** @MTU Aero Engines AG

## Why choose us as your partner?

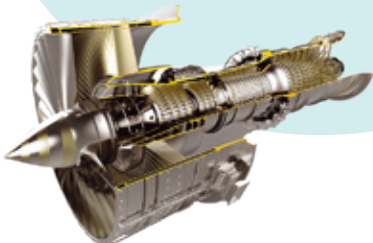
Our AM specialists have strong background in aerospace and defense. With them we provide:

- AS9100, ITAR registered, full spectrum AM capabilities for quality control and traceability, and affordability, with powder atomization, R&D, and production all delivered in-house
- Aerospace specific Applications Engineering with focus on areas like Generative Design/Lightweighting, highly customized parts, weld elimination, reverse engineering and replacement of obsolete parts
- Support for material and component qualification
- Collaboration opportunities: Material development, data set/ design allowables generation, R&D, application engineering, series production and prototypes



**Boeing partnership** to create standards processes for 3D-printed structural titanium aerospace parts

**Lufthansa Technik partnership** to establish replicable AM processes and standards for MRO applications





## Why choose us as your partner?

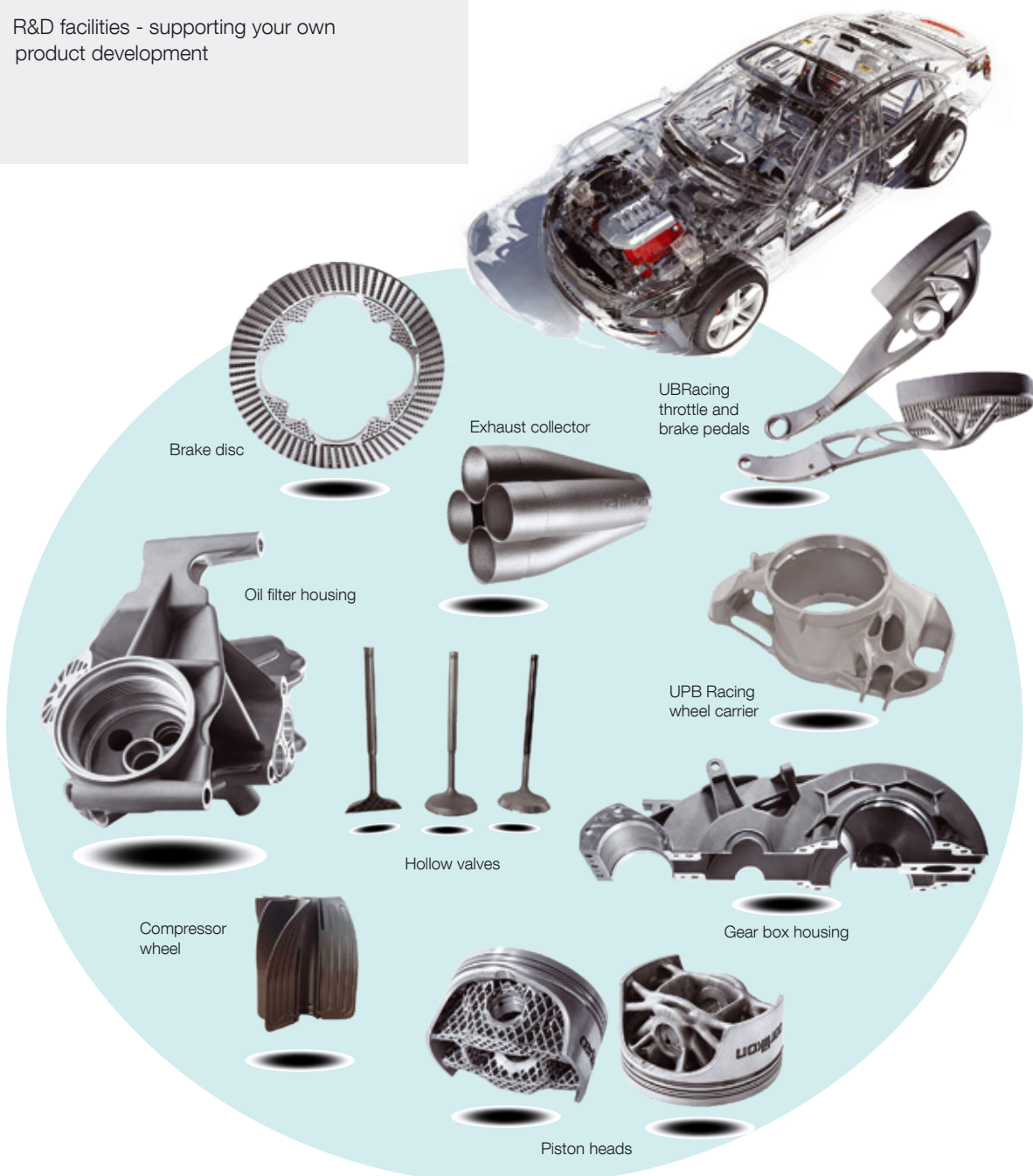
The Oerlikon AM team includes specialists with strong backgrounds in automotive engineering. With them we provide:

- Integrated services, from prototyping to production, delivering AM solutions for mass-market automotive applications
- Components with superior properties than conventional solutions
- Designs previously impossible to manufacture
- Consolidation of multiple parts to reduce weight and simplify the supply chain
- Expertise in materials – from metal alloys to plastics and ceramics
- New powder development – tailored and custom alloys designed and atomized in-house for tooling and component manufacturing
- R&D facilities - supporting your own product development

# Automotive

Increasing performance and efficiency for the automotive industry. AM offers the perfect balance of unique part construction, weight optimization, energy-absorbing designs, and smart components. It helps enable car manufacturers to meet new legislation targets for fuel efficiency.

When it comes to the precise demands of motorsports applications, AM delivers performance in the form of dynamic mass reduction, unique ergonomics, enhanced cooling, and part count reduction.



# Medical

Oerlikon AM is a leading manufacturer of orthopedic surgical implants and medical instruments. We offer end-to-end contract manufacturing using conventional or additive manufacturing methods. Our focus is on knee, shoulder, hip, ankle, spine and trauma implants, as well as for the veterinary implant market.

Our medical products team has a unique set of skills and processes aimed at serving the needs of orthopedic and spine implant companies. We provide a range of capabilities from manufacturing process development and design for manufacturing support, to production, finishing and quality testing.

We simplify our customers' supply chains. While offering conventional manufacturing capabilities with metal and medical grade plastic machining expertise, we also provide additive manufacturing capabilities. We are unique in the industry in that we provide laser and electron beam powder bed fusion options in metal additive manufacturing.

## Why choose us as your partner?

The Oerlikon AM team includes specialists with deep expertise in manufacturing for the medical industry.

Our capabilities include:

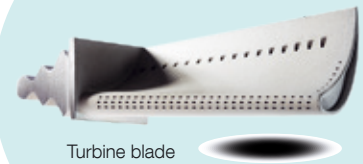
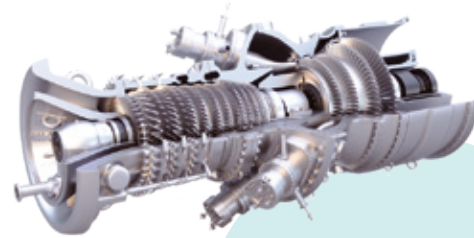
- Additive Manufacturing (Laser and Electron Beam)
- CNC Milling
- CNC Turning
- Swiss Turning
- Wire EDM
- Manual Milling and Assembly
- Deburring and Polishing
- Heat Treatment
- Hot Isostatic Pressing (HIP)
- Ultrasonic Cleaning
- Passivation
- Anodizing
- TiN coating
- Laser Marking
- Inspection





- AM design for higher functional integration within components such as manifolds, cooling ducts, molds with conformal cooling, semiconductor equipment and heat exchangers
- AM design for structural, heat-resistant and high-performance components such as swirlers, burners and fuel supply systems
- Our integrated capabilities allow for the complete component manufacturing process in our facilities: In-house material manufacturing, part printing, heat treating, stress relief, HIP, machining, and finishing, which provides you with the complete control of all processes and stream lined deliveries
- Expertise in materials – from metal alloys to plastics and ceramics and new powder development – tailored and custom alloys designed and atomized in-house for tooling and component manufacturing
- R&D facilities - supporting your own product development

# Power Generation



Turbine blade

# General Industries and Tooling



EGR pipe



Blowing tool bellow



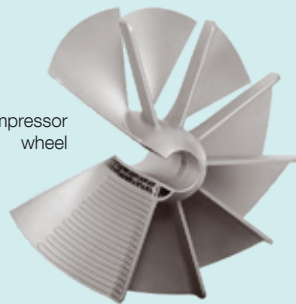
Vmax cover



Tool insert for cover flange



Oerlikon Metco HVOF Gun



Compressor wheel



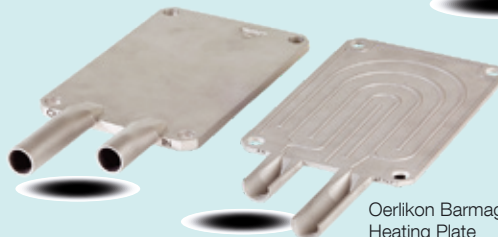
Knipex protective cap



Robot arm



Alstom filler hatch



Oerlikon Barmag Heating Plate



Oerlikon Barmag Heating Cuff

# Our AM offering extends across the globe

Our ability to deliver advanced materials and components on a global scale is yet another Oerlikon AM advantage. From Michigan to Munich, and from Charlotte to Magdeburg, we're your end-to-end AM provider.





**Magdeburg**

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39179 Barleben  
Germany  
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**Munich**

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Powder Distribution Center**

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**Powder Distribution Center**

Singapore

**We'll never stop  
expanding our capabilities**

When you're an industry disruptor, you can never rest on your laurels. We're constantly developing our innovation and production sites to serve you locally and with the latest technology.

Why not see what our experience and expertise  
in application-tailored solutions and materials  
developments could do for your business?

**If you can imagine it, we can build it.  
Come build with us.**

**oerlikon**  
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