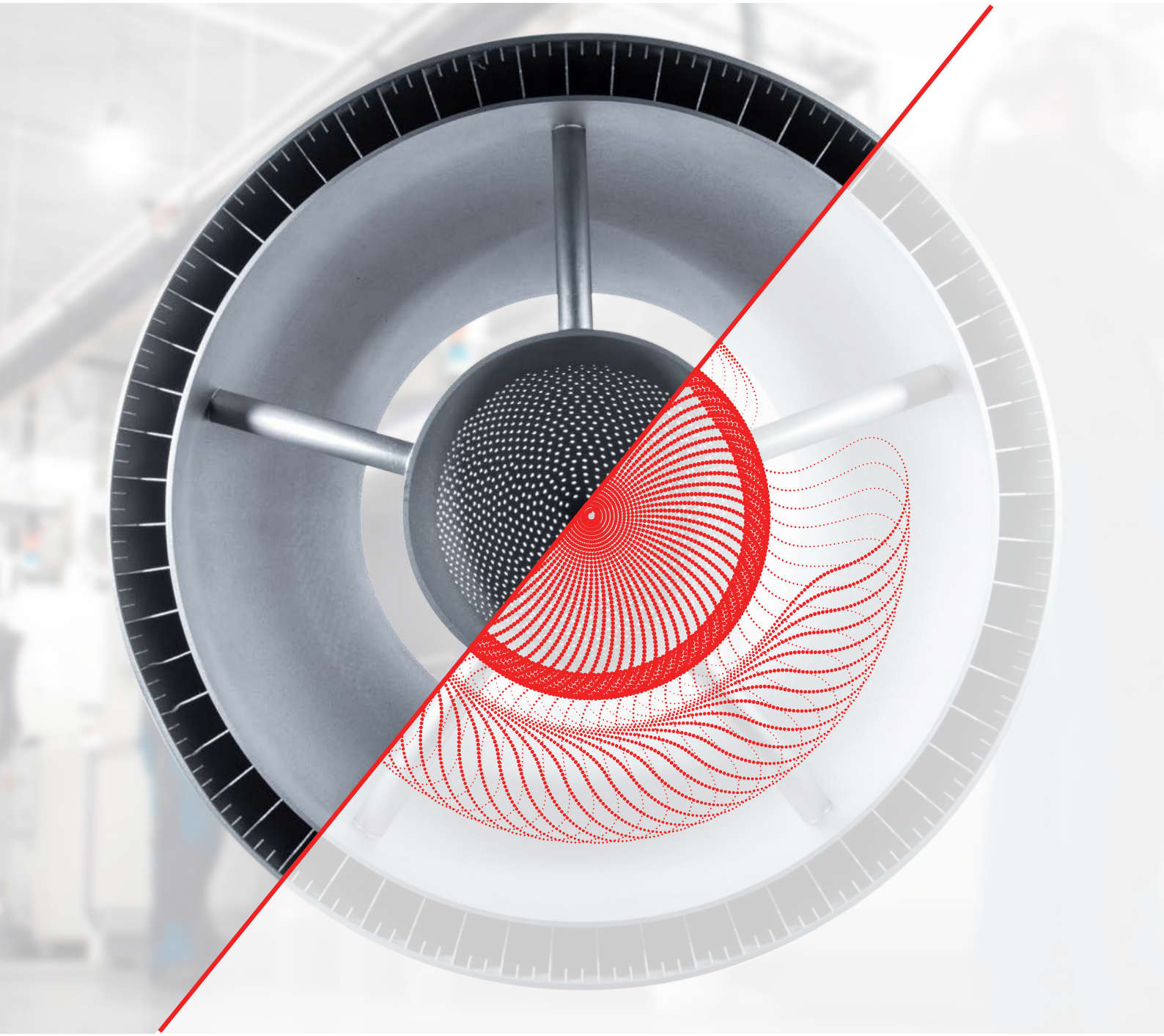
oerlikon
am

Additive Manufacturing Solutions

metal powders | prototyping | series production



With additive manufacturing, your greatest challenges now have solutions

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

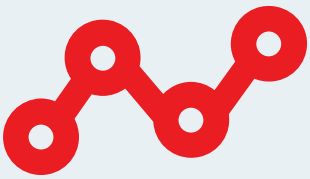
AM enables you to manufacture designs with less components, lower mass, and added features to optimize performance for each application.

Shorter innovation cycles

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

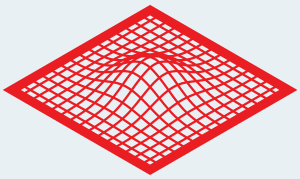
Until recently, additive manufacturing (AM) was simply a valuable tool for prototyping new products

Times have certainly changed, and for the better. AM has quickly evolved into a sustainable, cost-effective approach to manufacturing, one that impressively combines superior performance with the most desired properties for products within a wide range of industries. Now, more than ever, companies face intense pressure to reduce demands on finite energy and raw materials, all while design challenges become increasingly complex. Fortunately, advances in AM are making new solutions possible.



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.

The future of manufacturing is already here

All AM products start as a digital model which can be built by adding layer upon layer of metal powder. This powder is fully melted to the layers beneath it using a high-powered laser or electron beam; the process is repeated, layer by layer, until part completion. The types of parts possible range from a seat belt buckle to an oil tank to an orthopedic brace and more. With AM's rapid maturation rate, advanced manufacturing capabilities for parts like this won't remain a luxury—soon, it will set a new industry standard. The technology is already found in and being considered for the applications below.

Aerospace

Typical aerospace applications are complex engine parts, structural components and replacement parts. Additive Manufacturing enables the production of such parts at a **lower weight and significantly reduced life-cycle costs.**

For aircraft applications like brackets, ducting, and seat belt buckles, AM can be leveraged for **weight and flow optimization, sound reduction, near net part substitution, and part count reduction**.

AM can also have a significant impact on aero engines by **integrating components for reduced part counts and mass for compressor vanes, diffusers, acoustic attenuation, heat exchangers, and more**.

From brackets to instrument housings in helicopters, and from fuselage structures to battery compartments in UAVs, AM makes a difference in a variety of rotorcraft and defense applications.

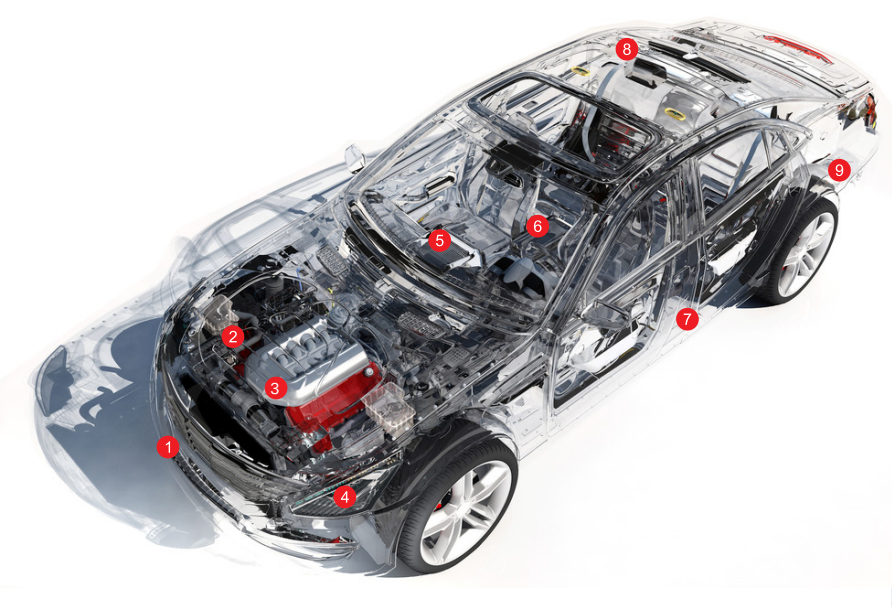
1. Brackets
2. Seat belt buckle
3. Ducting
4. Impact protection
5. Compressor vanes
6. System integration
7. Heat exchangers
8. Ducting
9. Diffuser
10. Acoustic attenuation
11. Vents
12. Windshield defogger duct nozzles
13. Brackets
14. Housing and enclosures
15. Drain fairings
16. Payload enclosures
17. Camera mount & gimbal
18. NACA duct
19. Fuselage structure
20. Fuel tank
21. Shrouds & closeouts
22. Wing structure
23. Battery compartment
24. Oil tank
25. Aileron & flaps

Automotive

Additive Manufacturing allows our customers the design freedom to consolidate several parts into one to reduce weight and simplify the supply chain.

AM offers the perfect balance of unique part construction, weight optimization, energy-absorbing designs, and smart components for various applications. 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.



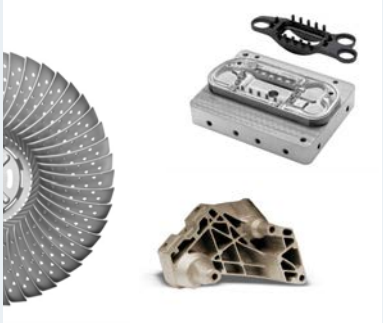
1. Crash structures
2. Battery technology
3. Low volume series
4. Suspension triangles
5. Personalization
6. Interior parts
7. Sensor integration
8. Frame nodes
9. Spare parts

Power Generation

Additive Manufacturing enables the production of highly complex turbine components from corrosion resistant superalloys that can operate in the most demanding environments. Our customers also benefit from our ability to provide a fully integrated contract manufacturing solution from powder to coated AM component.

For complex IGT applications, AM presents cutting-edge solutions, such as improved thermal management and fuel mixing, complex sealing geometry, and cost-effective manufacturing and replacement.

Tooling & General Industries



The use of Additive Manufacturing to produce tools and tooling components reduces lead times and costs. Additionally, it improves part functionality and provides design freedom to customize products.

AM can also be a game-changer for general industrial applications, offering high-heat resistant and lighter weight components—even using materials like titanium and nickel superalloys.

Medical

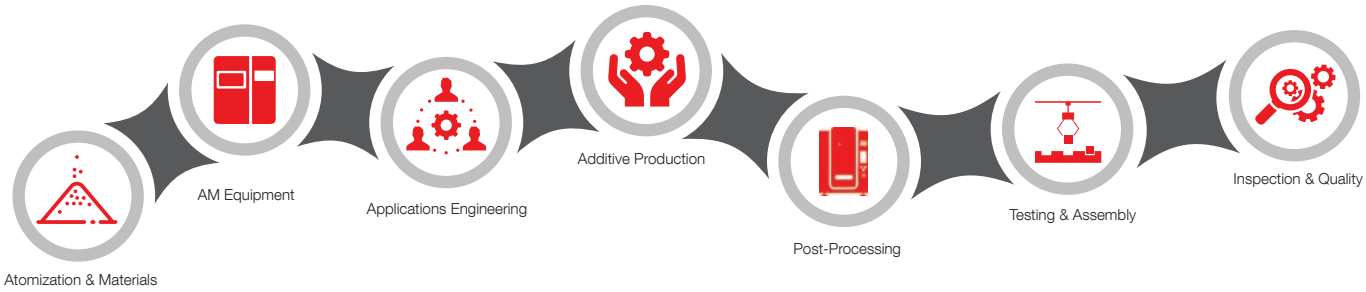
Since every patient is unique, Additive Manufacturing opens up new possibilities for patient-specific medical devices such as implants, instruments and surgical guides and models. The technology offers customization with the precision and quality required to have a greater impact on patient health than ever before.

Engineered skull plates, custom neck braces, heart pumps, and prosthetic limbs are just a few examples of how AM can contribute innovative—and life-altering—solutions to the medical industry.

We stand at the forefront of industrial AM

With our broad portfolio of surface technologies and advanced AM tested materials, our deep expertise in the design and engineering of industrial, metal-based components, and our unparalleled global service network, Oerlikon AM is 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.



We're with you from initial atomization to final inspection

No matter your additive manufacturing (AM) need, we're committed to creating infinite possibilities, and to pushing the limits of your potential. 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.

One of our greatest strengths is how our specific AM capabilities are strong in their own right, but also fully integrated in an effort to help our customers transform the way they build and create products.

Together, we'll bring your manufacturing dreams to life

Metal Powders

We have our own high-quality production facilities and a commitment to quality. We have 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	Ni 18Cr 18Fe 5(Nb+Ta) 3Mo 1Ti 0.6Al	-45 +15 / -63 +20
	MetcoAdd™ 625A / 625E	Ni 21Cr 9Mo 4Fe 4(Nb+Ta) 0.4Al 0.4Ti	-45 +15
	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	Co 28Cr 6Mo	-45 +10
	MetcoAdd™ 76A		-45 +15
	MetcoAdd™ 78A*		-45 +15
Fe-based	MetcoAdd™ 316L-A	Fe 18Cr 12Ni 2Mo 0.02C	-45 +15
	MetcoAdd™ 17-4PH-A	Fe 17Cr 4.5Ni 4Cu 0.3(Nb+Ta) 0.07C	-45 +15
	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™ H13-A/ H13-B	Fe 5Cr 1Mo 1Si 1V 0.4C	-45 +15/ -90 +45
Ti-based	MetcoAdd™ Ti-6Al-4V ELI-A / ELI-B	Ti-6Al-4V	-45 +15 / -105 +45

Metal Powder Production Technology

Troy (Operational)

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

Plymouth

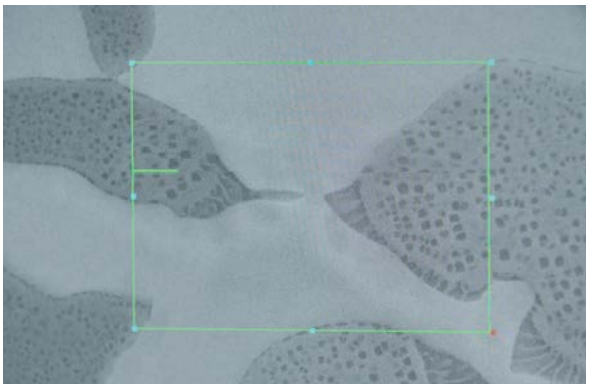
- Vacuum Inert Gas Atomizer (VIGA) for Ni, Co, and Fe powders (Nitrogen & Argon atomization gases)
- EIGA for Titanium powders – Grades 5 and 23 (Argon only)
- Dedicated R&D Atomizer: 250 kg heat sizes (Argon only)
- Onsite QA capabilities, packaging, and R&D development

Distribution Centers

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

Metal Powder R&D

- **R&D centers** (Munich & Charlotte) for testing and process parameter optimization on a variety of metal AM machines
- **Pilot atomizers** available for R&D powder development and analysis with 100 and 500 lb maximum melt capacities
- Oerlikon recently acquired Scoperta, a technology company with 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 power generation, automotive and aerospace.

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.

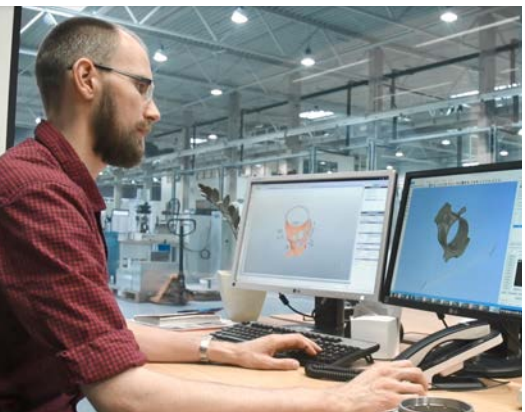
- Sand/ Precision Casting
- Die Casting
- HSC/CNC Milling
- Injection Molding
- Elastic Components

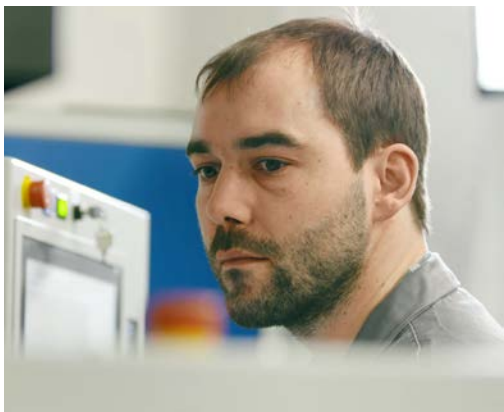
Design & Applications Engineering

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

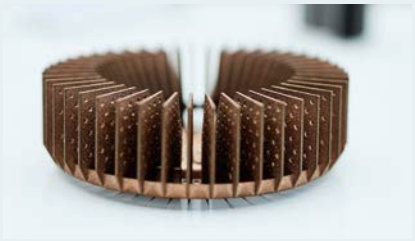
Our complete unique in-house capacity includes Post-Processing and expertise in surface engineering with both thin and thick film coatings and final processing. Hot Isostatic Pressing, vacuum heat treatment, CNC machining, surface finishing, and metallurgical evaluation enable us to provide finished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





AM Metal Production
EU / USA

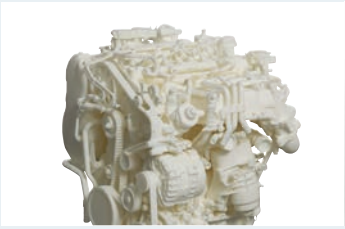
	Materials
Al	AlSi9Cu3, AlSi7Mg, AlSi10Mg, AlSi12CuNiMg, AlMgSc (Scalmalloy)
Ni	Alloy 718 (2.4668), Alloy 625 (2.4856), Alloy X (2.4665), Haynes 282
Co	CoCrMo (F75)
Fe	18 Ni Maraging Steel (1.2709), 316L (1.4404), 17-4PH (1.4542), 1.4859, 1.4308 (CF8)
Ti	Ti-6Al-4V
Cu	CuNi2SiCr



Laser Powder Bed Fusion of Metals (PBF-LB/M) also known as SLM

Concept Laser / Arcam	2x Concept Laser M2 (1kW)	3x Concept Laser M2 (2x 400W)	1x Arcam Q20+	
EOS	1x EOS M270 (200 W)	3x EOS M280 (400W)	12x EOS M290 (400 W)	5x EOS M400 (1kW)
Trumpf	4x Trumpf TruPrint 1000 (200W)	3x Trumpf TruPrint 3000 (500W)		
SLM Solutions	3x SLM280HL (400W)	1x SLM280HL (2x 400W)	1x SLM 125HL (400 W)	
Renishaw	1x RenAM 400HT (400 W)	1x RenAM 500Q (4x 500 W)		

AM Polymer Production EU



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

EOS	1x EOS Formiga P100	1x EOS Formiga P110	1x EOSINT P390i	2x EOSINT P396i

Materials

Polyamides: PA12, PA12-GB, PA12-CF, PA12-Al (Alumide™)

Thermoplastic Polyurethane (TPU)

Vat Photopolymerization (VPP) also known as CLIP

Carbon 3x M2 Printer / 1x Smart Part Washer

Materials: EPU, RPU, CE, UMA

AM Ceramic Production EU

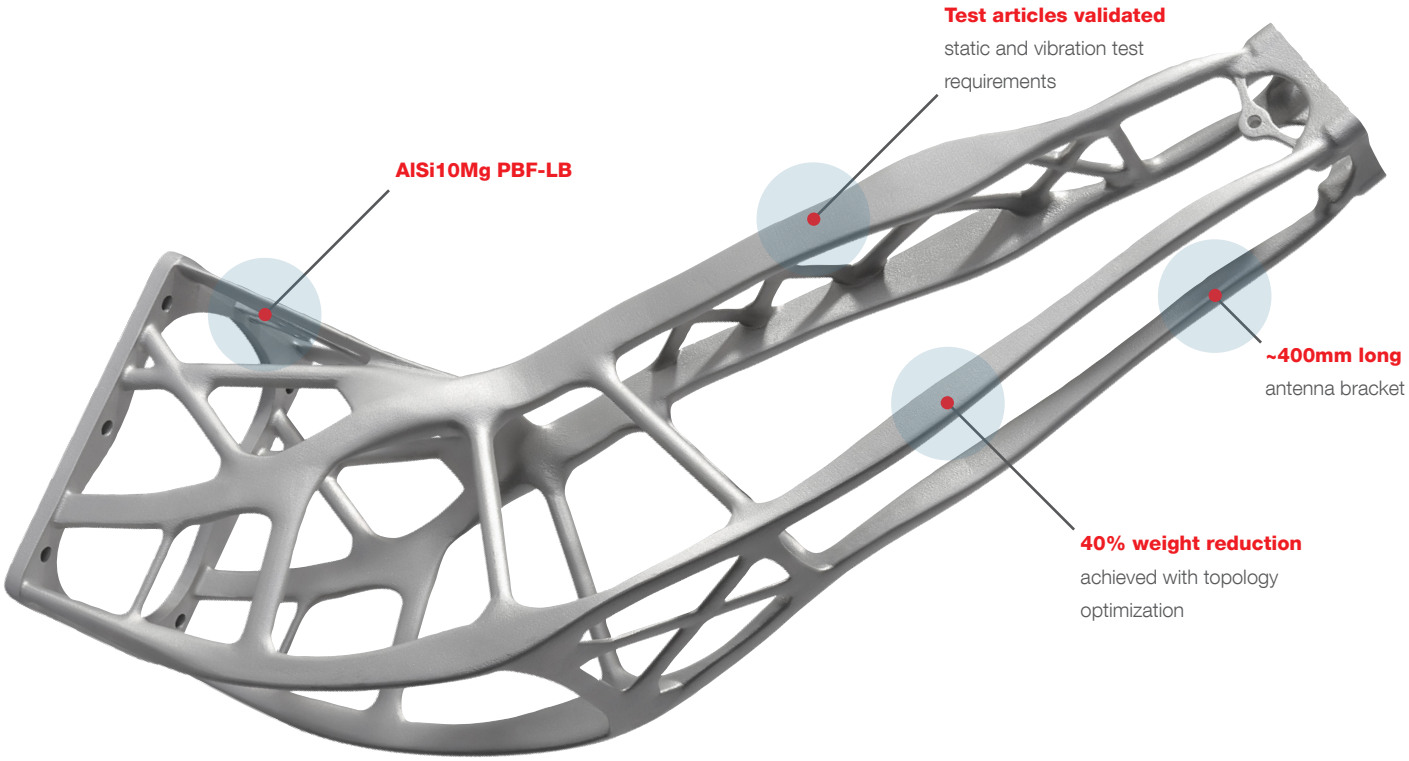
MJT – Material Jetting of Ceramics also known as NanoParticle Jetting™

XJet 1x XJet Carmel 1400 AM

Material: Zirconia (ZrO2)

Sentinel Satellite Antenna Bracket

AM can make a difference in the smallest of parts, and those small parts typically add up to a much greater whole. This is definitely true in the case of Sentinel Satellites. If a single component like an antenna bracket fails, the satellite's mission could be doomed from the start. Ultimately, the ideal mix of project partners and the flexibility of our AM technology allowed us to produce an aerospace structure that exceeded expectations.



AM application expertise | Increased reliability | Failure reduction | Effective timetable | Cost optimization | Weight reduction

Challenge

- Optimize design for strength and weight
- Produce test components
- Static and vibration testing
- Reliability testing

Our solution

- Consolidation into a robust single part design
- Validation made possible through the production of two antennas, 30 tensile pieces, and other test items on a single build at Magdeburg facility EOS M400.

Customer benefit

- Certified product for space application
- Minimum strength requirements exceeded by >30%
- Highly uniform stress distribution
- 40% weight reduction
- Lowered system costs and fuel consumption

RUAG Aerospace — Project Management, Design Optimization, and Testing

citim a member of the Oerlikon Group | oerlikon — Additive Manufacturing Production

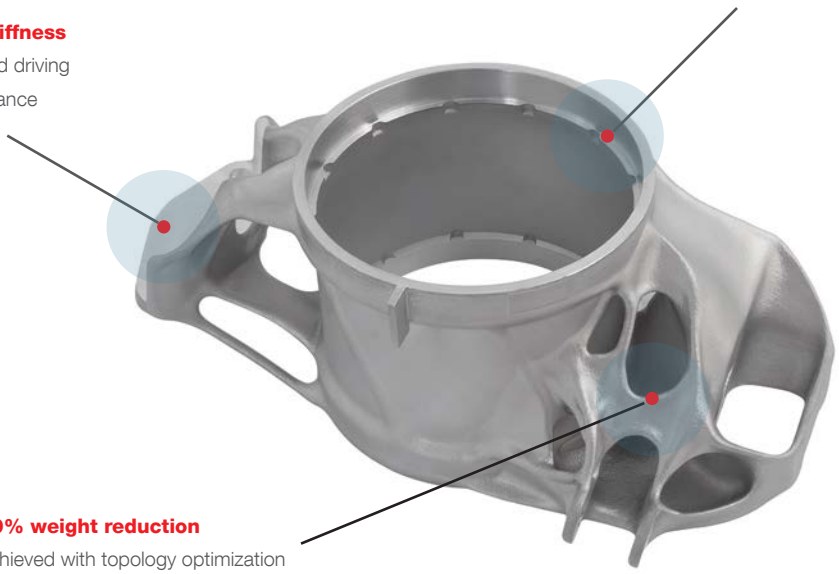
EOS | Altair — Project Partners

Wheel carrier

Oerlikon AM can deliver automotive prototypes and drive weight saving designs from the AM lab to the road

Post-processing
CNC machining

High stiffness
improved driving performance



80% weight reduction
achieved with topology optimization

upb racing

AM application expertise

Increased reliability

Weight reduction

Effective timetable

Cost optimization

Challenge

- Weight saving
- Part of unsprung mass
- Required sufficient stiffness for vehicle responsiveness

Our solution

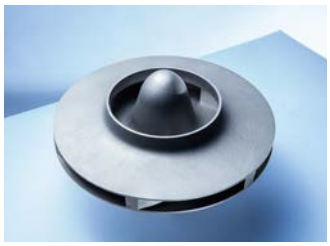
- Optimal coordination of construction and production
- Topology optimization
- Accurate design implementation
- Almost no manufacturing limitations

Customer benefit

- 80% weight reduction with consistent or improved mechanical properties

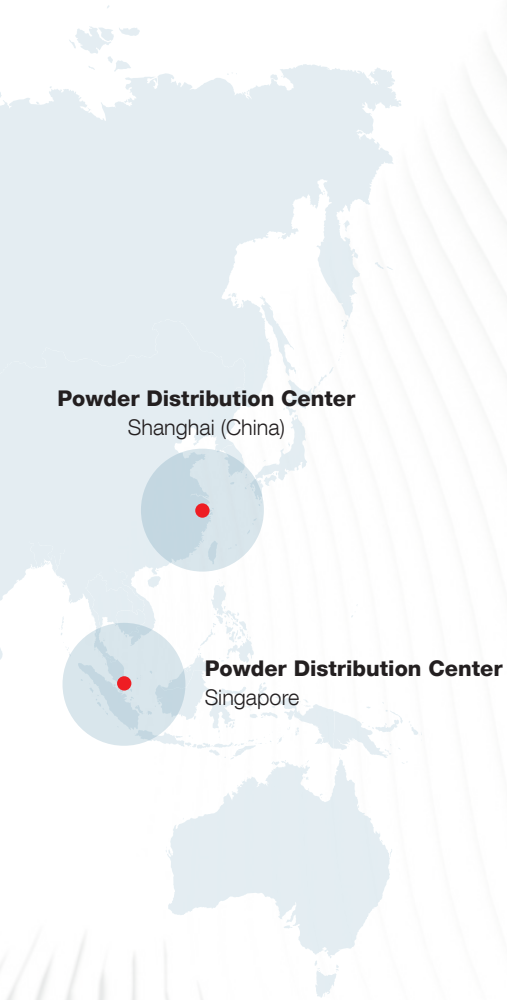
Other case studies





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.



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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.

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