

High Strength Aluminium meets
Responsible Manufacturing
- 3d printed parts with **EOS Al2139 AM**

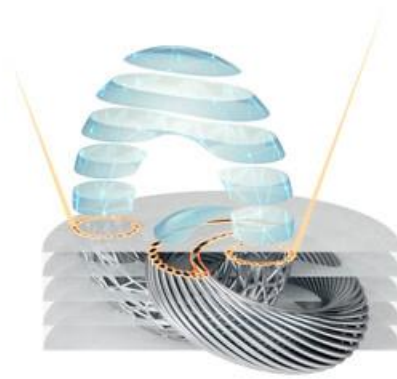
Additive manufacturing principle



Create digital 3D model



Slice 3D model



Print part layer by layer
Powder Bed Fusion Technology



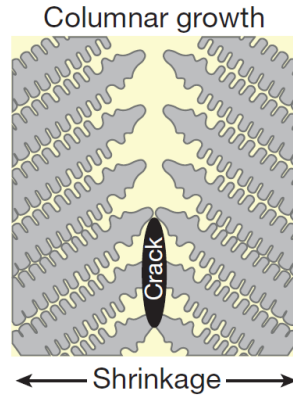
Final Part

High strength aluminium in AM

Primary Challenge

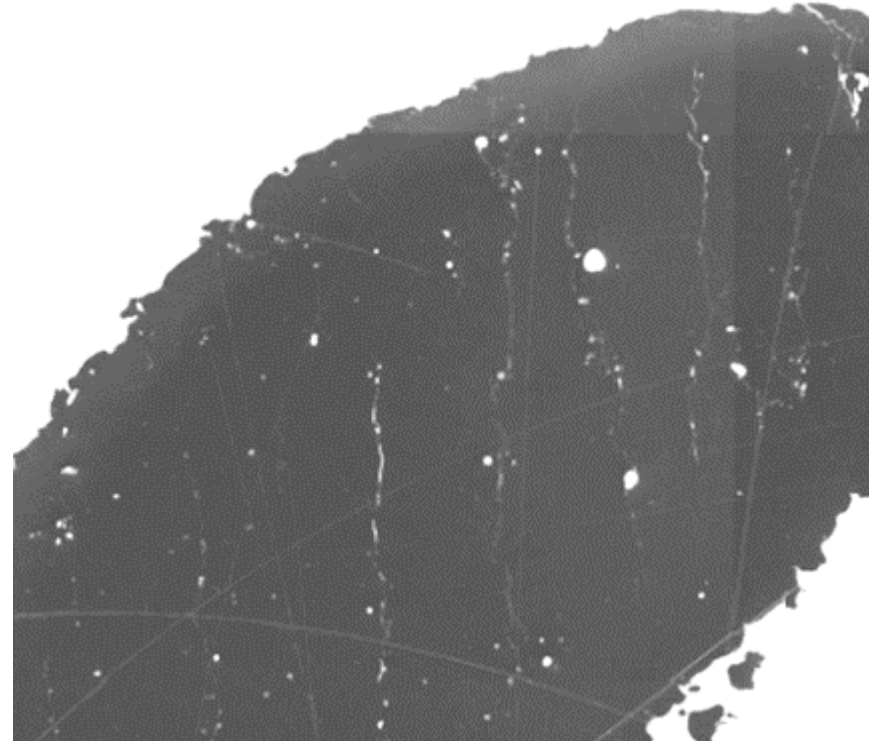
- Extremely high cooling rates
- Wide solidification range
- **Solidification cracking**

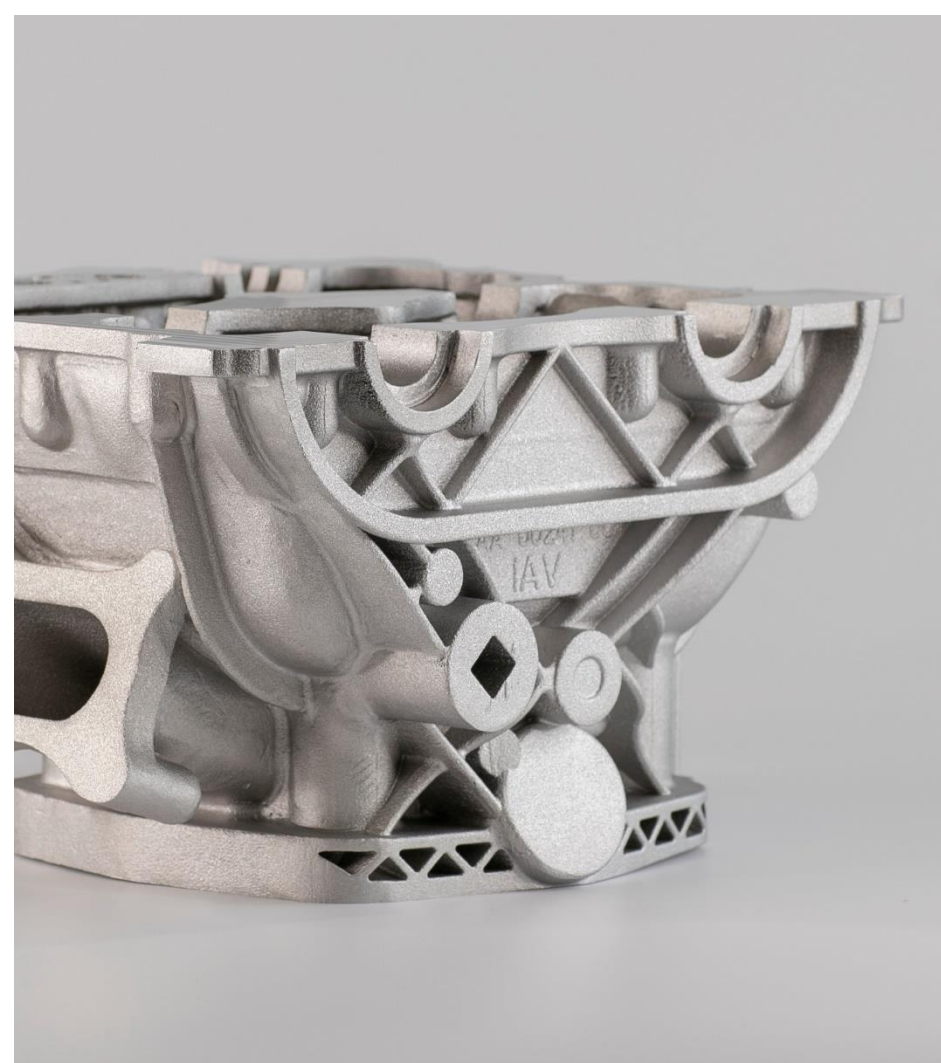
(present in 2000-, 6000- and 7000-series Al alloys)



Current solutions:

- Modification from standard chemical composition
- Addition on nucleants (non-metallic or metallic)
 - Additives within / among powder
- New high strength alloys for AM
- Extreme processing conditions





EOS Aluminium Al2139 AM

60 μ m for EOS M290

50 μ m for EOS M400-4 (release Q4/2022)

Outstanding strength within AM aluminum alloys



EOS Core

EOS Aluminium Al2139 AM

60µm | EOS M290



EOS Core

50µm | EOS M400-4

Chassis bracket



Wheel carrier



Main Characteristics

- Unmatched strength in temperatures between 50-200 °C
- Robust one-step heat treatment (T4)
- No additions / MMC or rare earth elements
- Parts can be electropolished and anodized

Typical Applications:

- Aviation & Space industries
- Racing, Transportation & Mobility
- Lightweight designs

Anodized flow adaptor

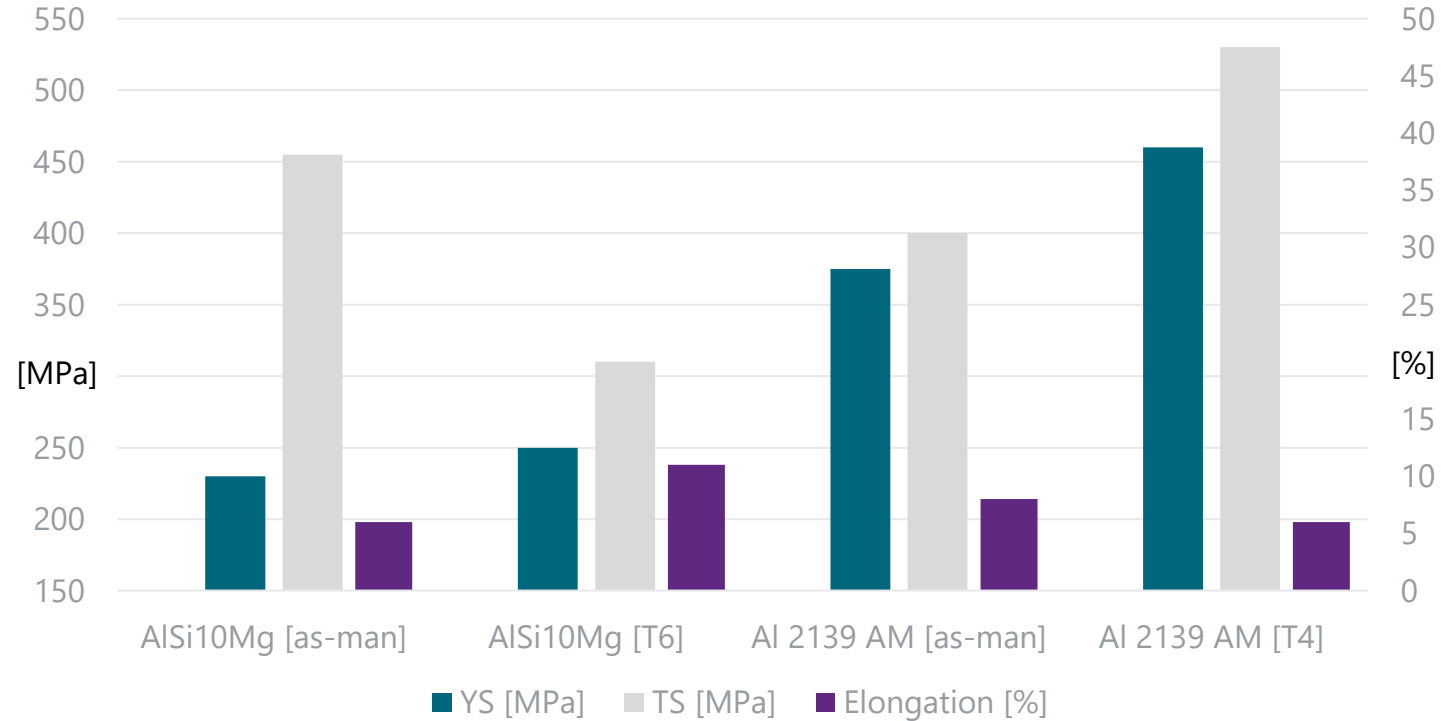


Cylinder head



EOS Aluminium Al2139 AM vs AlSi10Mg

Room temperature mechanical properties



EOS Aluminium Al2139 AM vs AA7075

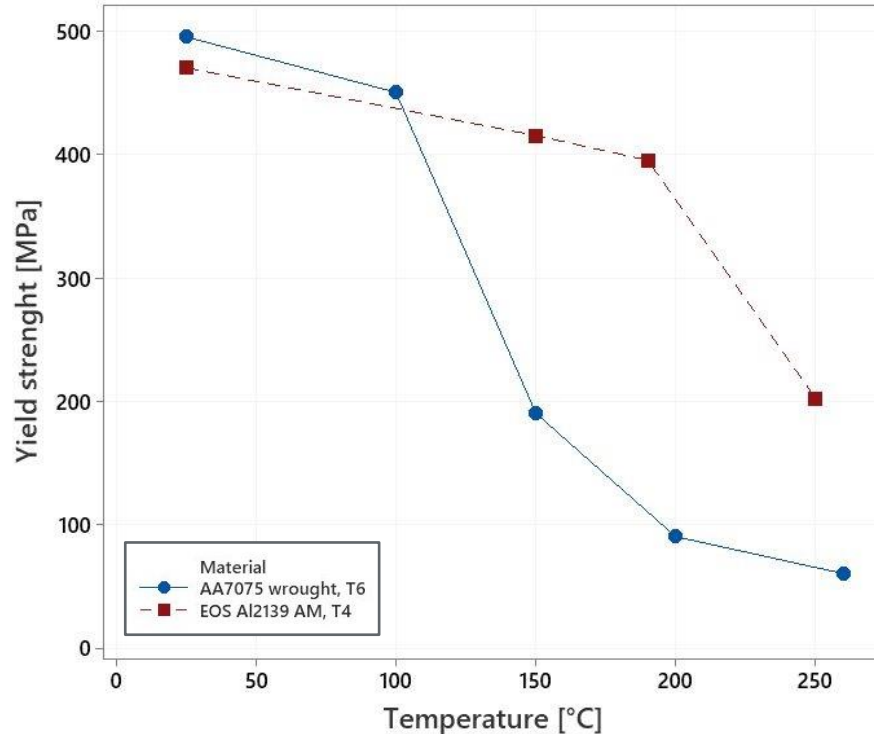
60µm | EOS M290

50µm | EOS M400-4



- Similar yield strength at room temperature
- Improved properties above 150 °C
- Limited endurance above 250 °C

Yield strenght [MPa] vs Temperature [°C]



EOS Aluminium Al2139 AM

60µm | EOS M290

50µm | EOS M400-4



CORE TRL 3



Early customer access for new solutions

Limited promise on technical performance and no statistics yet available



Restricted quality assurance procedures in place



Development still ongoing
Upgrades/changes possible



Products have smaller stocks
and might have longer
delivery lead times

EOS Aluminium Al2139 AM

60µm | EOS M290

50µm | EOS M400-4



CORE TRL 3



Early customer access for new solutions

Limited promise on technical performance and no statistics yet available



Supporting & part design
need more attention



Massive & bulky parts
challenging due to internal
stress build-up



Avoid sharp corners
in parts

Involve EOS Application engineering team!

*Ensure the suitability of customer application
and part & support design for Al2139*

EOS Aluminium Al2139 AM

Key Differentiators vs. Competitor alloys



EOS Aluminium Al2139 AM

- Higher strength
- Higher productivity
- More affordable powder
- Comparable strength at room temperature
- Higher strength at elevated temperatures
- Available in AM
- Higher strength
- More affordable than A2024-RAM2
- Faster and more simple heat treatment than A20X

Scalmalloy

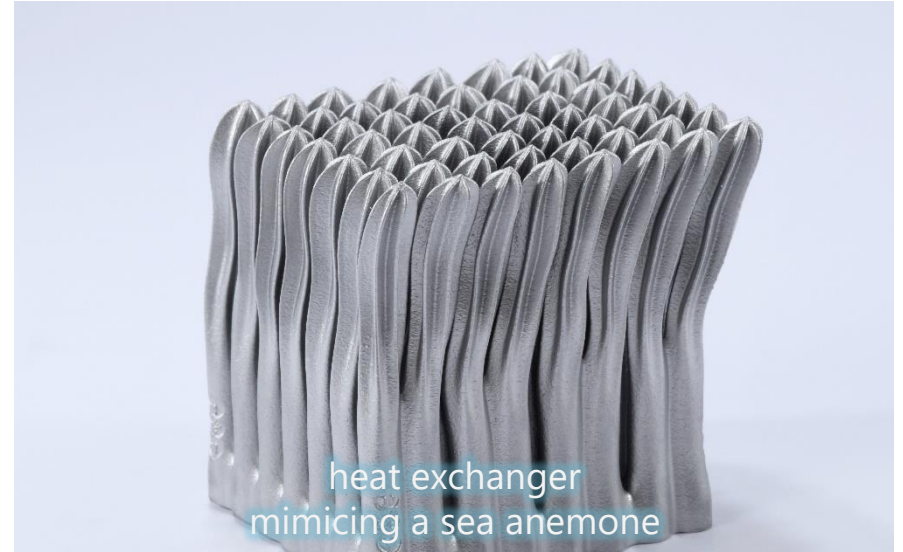
Wrought 7075, T6

A20X by Aeromet
A2024-RAM2 by E3D



AM possibilities with responsible manufacturing

Additive Manufacturing brings new possibilities



Heat exchangers – optimized thermal management

Improved efficiency

300% higher heat rejection

Weight reduction

22% reduction in weight



Technology enablement

Enables new sustainability applications due to small footprint and improved thermal management



Ariane 6: Injector head – Mission critical class 1 component



Benefits

- From 248 parts to 1 single unit
- No weak points
- 50% lower costs
- 25% less weight
- Lead time from 3 months (casting) to 35 hours



Dual function inductor

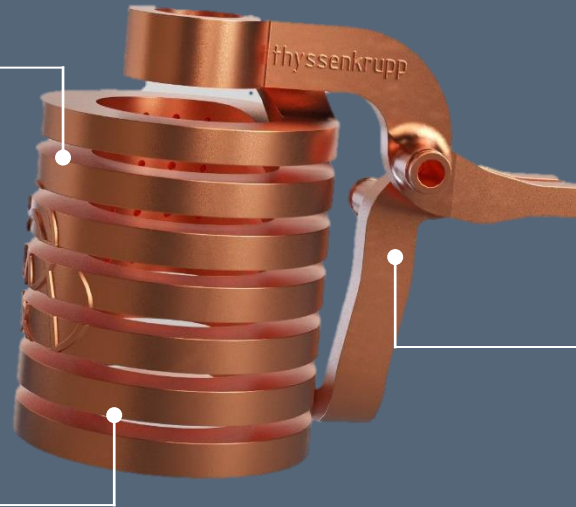


thyssenkrupp



Less power consumption

During use, this dual function inductor needs up to 60% less energy



Higher productivity

Through its 2.5 times longer life time compared to conventional inductors, it has a higher productivity and needs less material for re-production

Additional benefits

Functional integration of heating and quenching, flow optimized cooling channels, up to 58% reduction of part cost



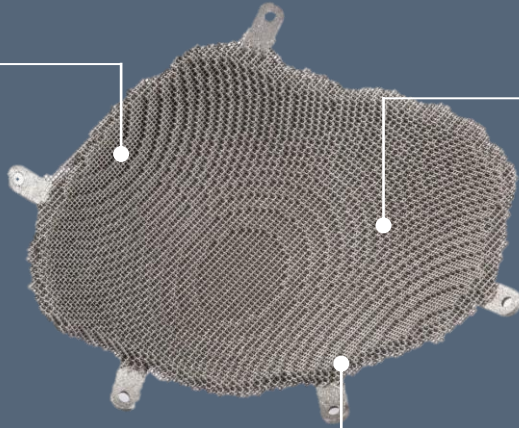
Customization



Custom cranial implant

Patient specific reconstruction

CAT scan based implant creation to recreate patient specific features



On demand production

Reduced scrap and waste due to on demand production.

Improved patient recovery

Bone like structure to improve patient recovery time





On demand
and decentralized
production

Digital Spare Parts Warehouse for Buses

Sustainability aspects

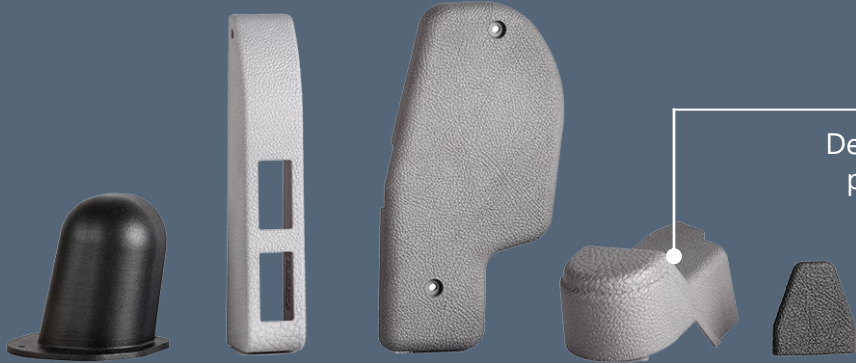
Less transportation and warehousing, less overproduction and extended use phase due to repair on demand

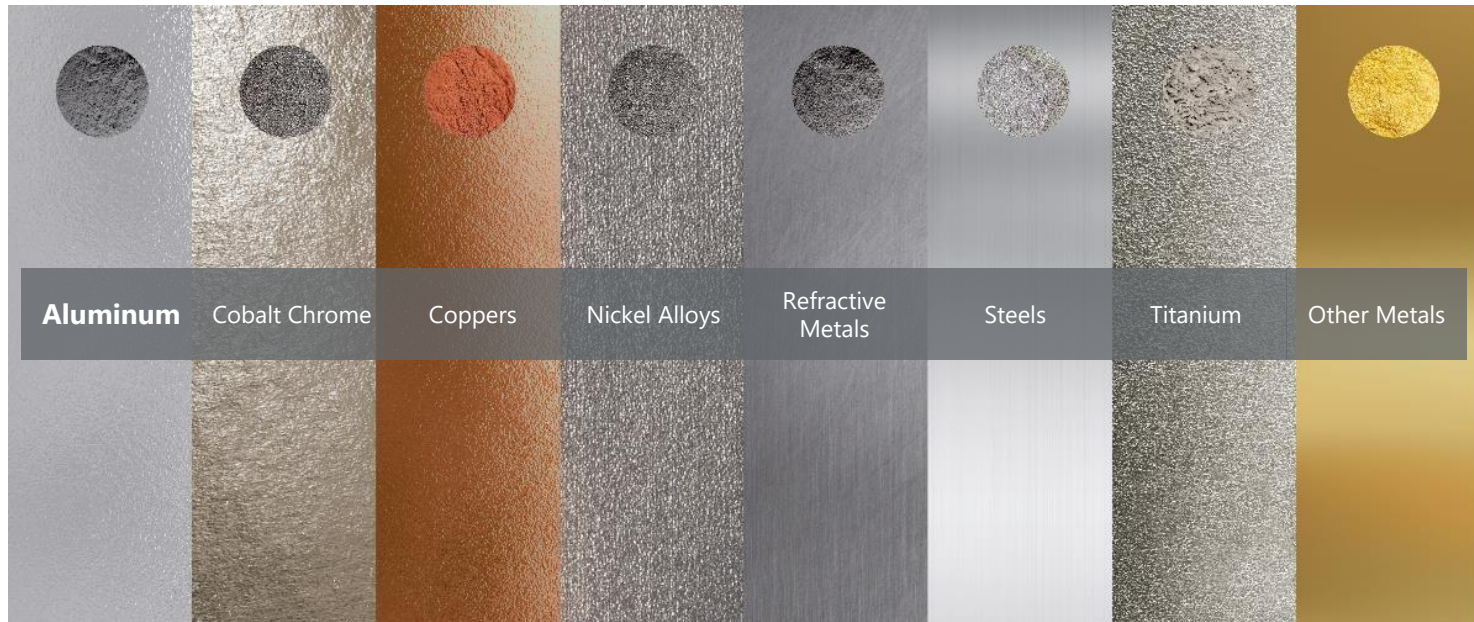
Digital warehouse

Digital and sustainable spare parts management for buses

Increased profitability

Decentralized manufacturing of 3D printed components for buses on demand





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