



GF Casting Solutions

Herausforderung beim zerstörungsfreien Prüfen von sicherheitskritischen AM Bauteilen

GF – three strong divisions

Georg Fischer AG

2021

GF offers pipes for the safe transport of liquids and gases, lightweight casting components in vehicles, and high-precision manufacturing technologies.



GF Piping Systems

1'823 Mio. EUR Sales



36 Production Sites



7'686 Employees



GF Casting Solutions

814 Mio. EUR Sales



14 Production Sites



4'008 Employees



GF Machining Solutions

808 Mio. EUR Sales



28 Production Sites



3'282 Employees



Production technologies



High-pressure die-casting



Precision casting




Iron casting



Additive manufacturing





GF Casting Solutions

AMotion Center – Additive Manufacturing

Additive Manufacturing Switzerland



We help you move your application to Additive Manufacturing:

The whole value chain

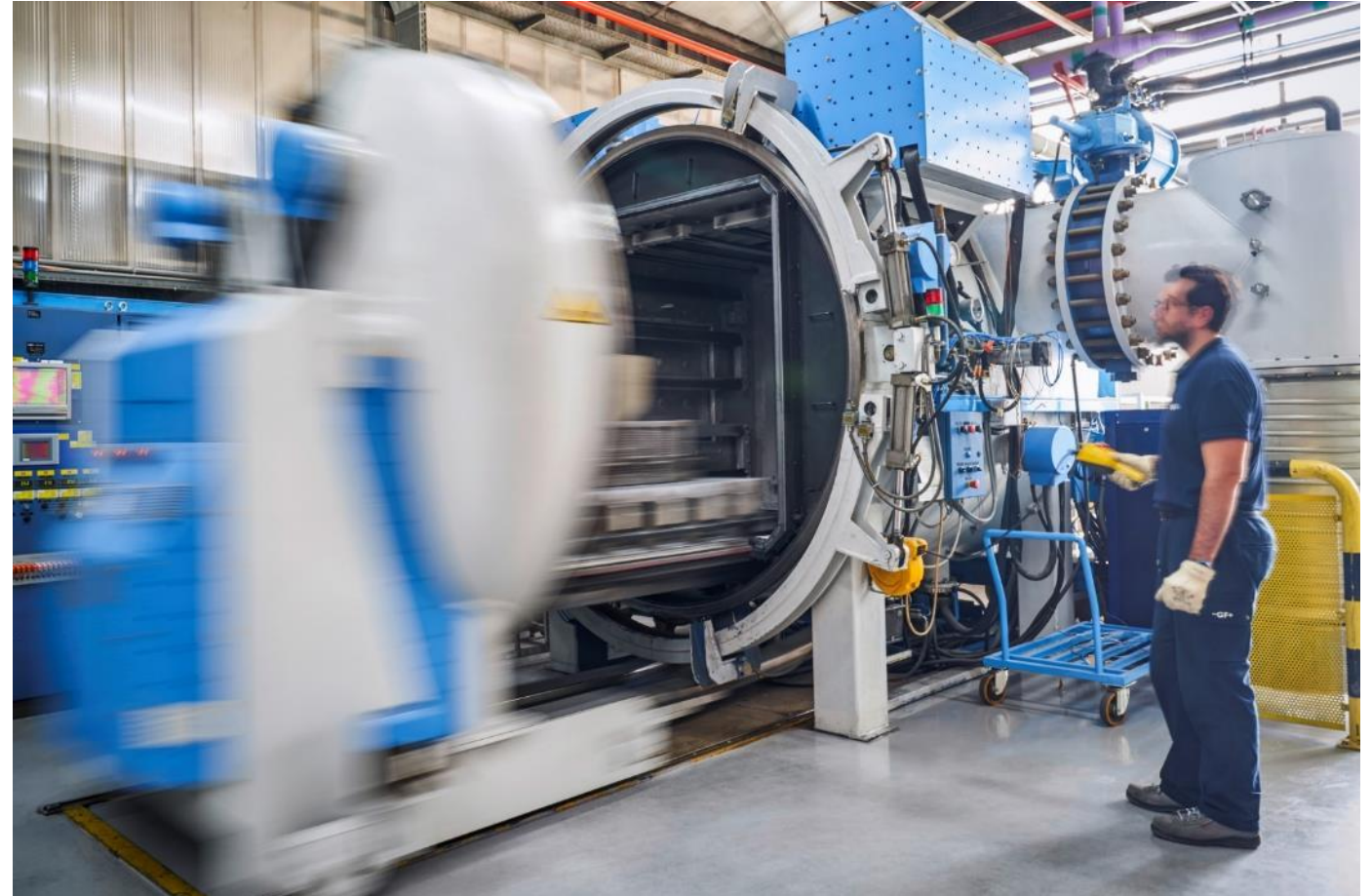
One offer



Our post-processing capabilities



- Vacuum & Cryogenic Heat Treatment
- NDT inspection
 - Analog & Digital RX
 - FPI
 - 3D measurement
 - CMM
 - Bluelight scanner measurements syst.
 - Electronic gauges
- Welding
- Flow testing (Air + Water)
- Installation for chemical etching
- Surface superfinishing processes
- Finishing and polishing with more than 50 years of experience
- Computer tomography
- Machining for semi finished and finished components
- HIP (not in-house)



What drives our market

Modern communication, autonomous driving etc. have led to increasing numbers of satellites in orbit:

- **2010**: ~ 1'000 satellites
- **2021**: ~ 5'000 satellites
- **2030**: current estimations: > 30'000



Cost per KG payload will decrease

- from >50'000 USD/KG in 1980
- to 1'500 USD/KG in 2020
- to **200 USD/KG** in 2025





+ Sending payload into orbit is getting cheaper than ever before

Part geometry & data

Material: Inconel 718

Density: 8.2 g/cm³

Weight: 20 kg

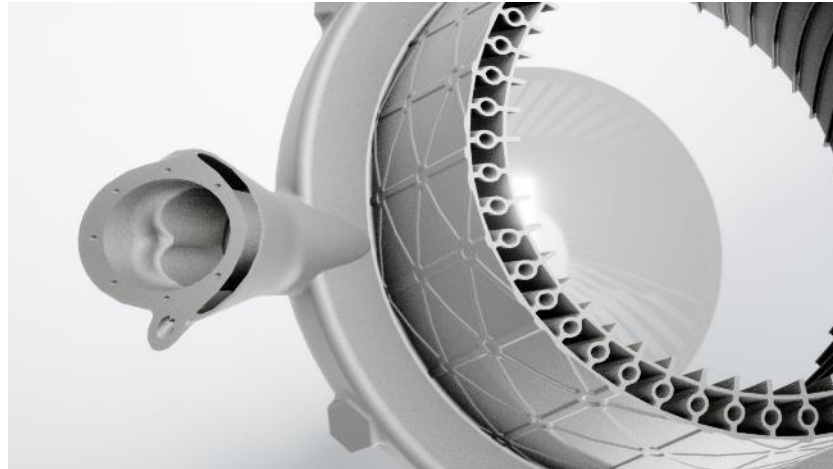
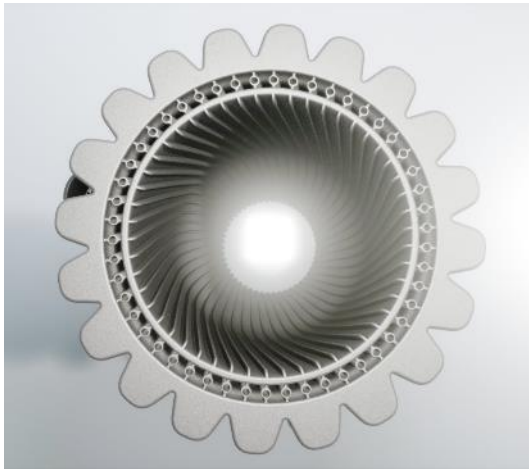
Volume: 2'576 cm³

Dimensions: 365 x 420 x 425 mm



Optimized part cooling

- Conformal cooling channels in near-netshape design
- Optimized cooling ribs
- Old design needed many different manufacturing processes: additive design reduces the number of steps drastically
- Cost advantage: not only within the geometry and performance of the application but cost savings through the simplification of the supply chain



Challenges when testing AM components

Cracks

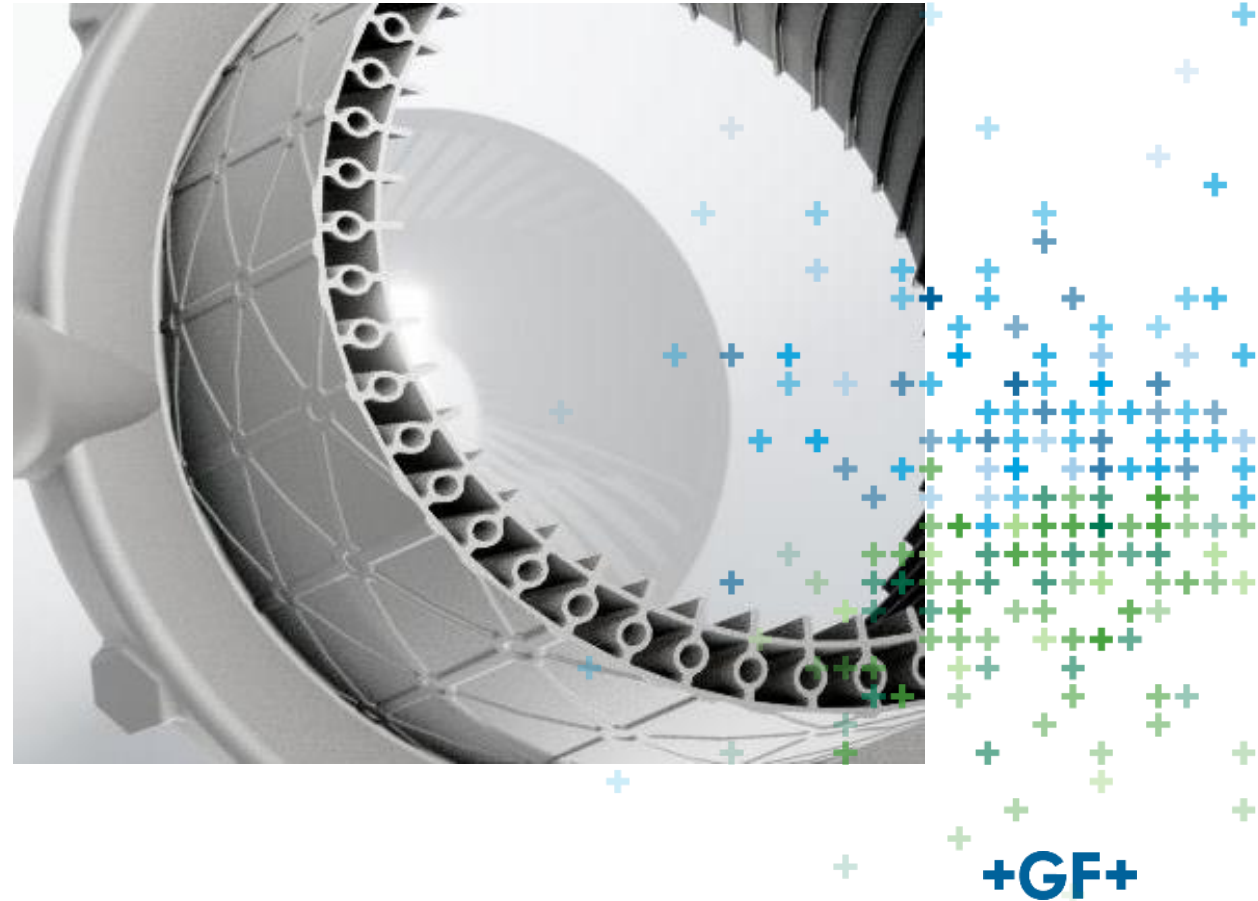
How can we find macro or even micro cracks inside complex components?



Challenges when testing AM components

Dimensional measurements

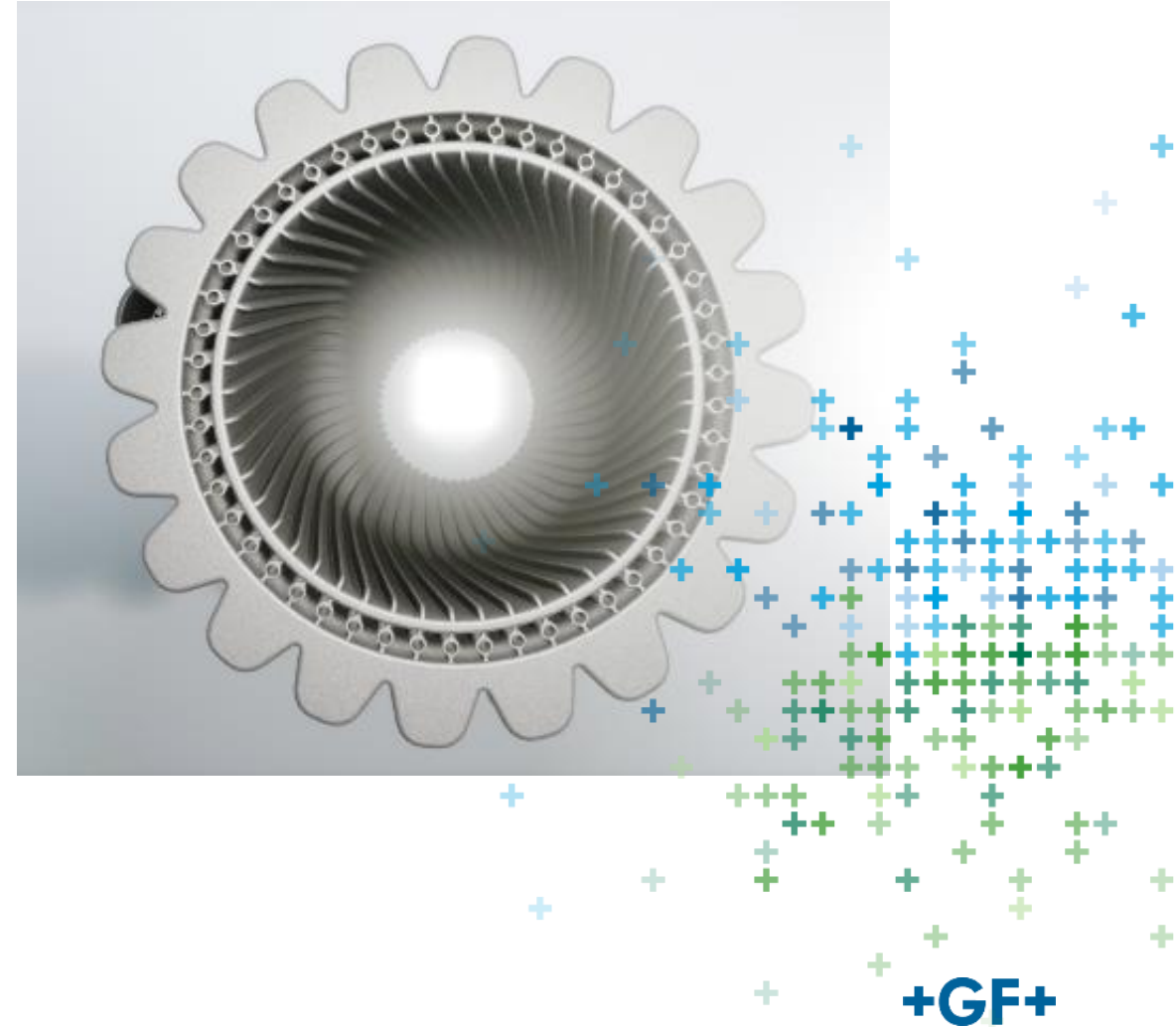
How to measure hard-to-reach surfaces?
How to measure complex internal cavities?



Challenges when testing AM components

Material properties

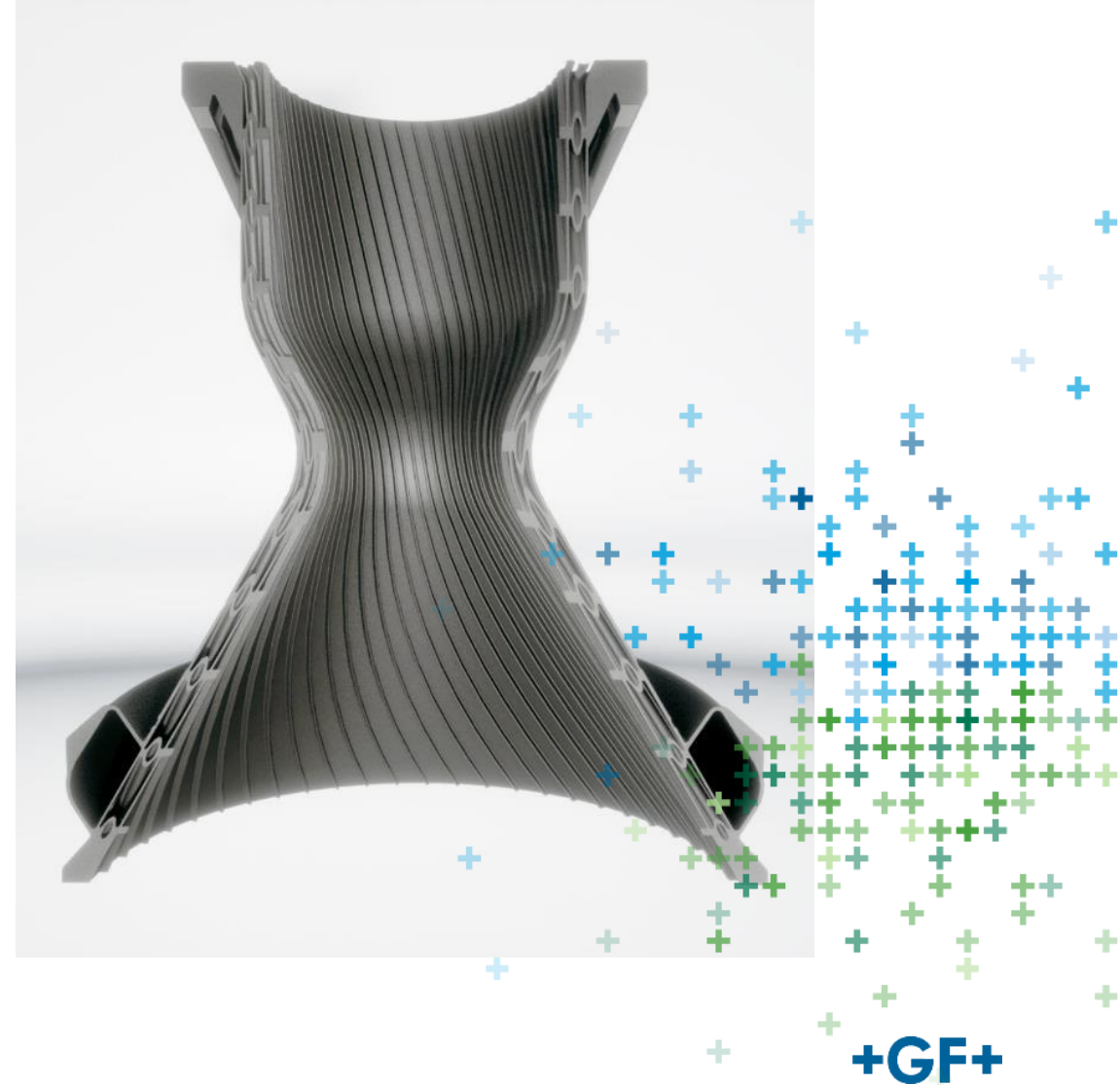
How can we inspect the material properties of complex components?



Challenges when testing AM components

Depowdering

How can we ensure that there are no powder residues in the internal channels before heat treatment?



Solutions when testing AM components

Traditional inspection methods quickly reach their limits

New methods such as CT do not provide reliable results and have very high cost

Inspection procedures during printing are not accepted by the end customer

Adapt existing methods. Such as air and water flow tests

Research and development which must look for new practicable and affordable solutions

Time. Create statistics and confirmation that this methodology works reliably



Collaboration



We team-up with you





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Thank you