CT for Additive Manufacturing

Dimensional Control and Quality Assurance with Industrial Computed Tomography (CT)

Key advantages of industrial CT:
- Powder characterization
- Validation of machine and process performance
- Internal and external dimensions
- Inclusions and porosity
- Actual vs nominal CAD comparison
- Residual powder identification
- Reverse engineering for AM spare part production

Precision 3D printing needs precision 3D scanning

Additive manufacturing enables the creation of more complex parts than ever before. Fortunately, there is one technique ready to inspect and measure complex internal structures that can’t be seen by any other nondestructive testing method: Industrial CT.

Advanced CT enables design optimization, component validation and quality control for additive manufactured parts at the speed of production. GE’s CT systems combine the power of advanced healthcare components and unique high throughput technologies to create and analyze volumetric data sets of the as-built component with the speed and accuracy to support needs ranging from prototyping to production.
Additive Manufacturing – Where and how CT can add value?

**Powder characterization** » Check powder grain sphericity & size, distribution, porosity inside the grains, foreign particle contamination

**AM machine validation** » Verify system performance, merge with in-situ monitoring

**Component optimization** » Conduct rapid prototyping, quality assurance (failure analysis, dimensional measuring, pre-machining tests, print process optimization) of printed workpieces

**Quality assurance** » Perform CT measurements to help defining guidelines in volumetric inspection, complementing to standard NDT techniques for surface and below surface inspection

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References:

**CT Volume Visualization & Evaluation**
Volume Graphics, volumegraphics.com

**AM Machines, Materials, Software & Consulting Services**
GE Additive, ge.com/additive

**AM Technology Research**[^1]
DMRC, dmrc.uni-paderborn.de/de

**AM Software and Services**[^2]
Materialise, materialise.com

**AM Materials Technology**[^3]
Access e.V., access-technology.de

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[www.gtmeasurement.com/CT](http://www.gemeasurement.com/CT)

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[^1]: Powder Characterization: nanoCT® scan of a Titanium aluminide SLM capsule sample with nominal grain size 40-90 µm: automated colored particle size segmentation.

[^2]: 3D Failure Analysis
Inclusions, porosity, cracks or even residual power can be identified and analyzed with respect to size and positioning.

[^3]: Nominal / Actual comparison
Compare 3D reconstruction of the as-built component to the as-designed CAD model to view color coded variation mapping.

Before printing optimization

Smaller and 1/3 less pores after optimization

**Coordinate Measurement**
Create accurate measurements of internal dimensions, wall thicknesses and other features that may be difficult or impossible to measure with traditional non-destructive methods.

**Structural Mechanics Simulation**
Based on your real AM parts’ CT data instead of idealized CAD data, Volume Graphics’ mechanical simulation tool enables you to reliably predict the structural weak points.

**Process Validation and Optimization**
Use statistical 3D information to shorten manufacturing ramp-up times and for improved reaction on process fluctuations.

**Authenticity Verification**
Check internally printed data matrix codes of original spare parts.

**Powder Characterization**: Inclusions, porosity, cracks or even residual power can be identified and analyzed with respect to size and positioning.

**3D Failure Analysis**
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**Nominal / Actual comparison**
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www.gemeasurement.com/CT