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Quality Control in Additive Manufacturing

with Volume Graphics Software

Get Full Control from Lab to Fab

with Volume Graphics Software

When you inspect safety-relevant components, every little detail counts. From powder to printed part, from lab to fab—Volume Graphics software gives you the insights to constantly push the quality boundaries of your additively manufactured parts and establish efficient workflows. The software runs on data provided by the latest CT technology.

Volume Graphics software enables you to identify the most important 3D printing defects, whether from the raw material or the post-processed end product. No matter how complex the shape might be, Volume Graphics enables your metrology department to sign off on processes and accurately inspect your 3D-printed parts.



Why CT?

The Most Advanced Technology for
3D Inspection

Additively manufactured products need to be thoroughly inspected to be certified for high-risk use cases. Computed tomography (CT) is the most reliable technology for identifying 3D printing defects and enabling the best possible 3D printing quality.

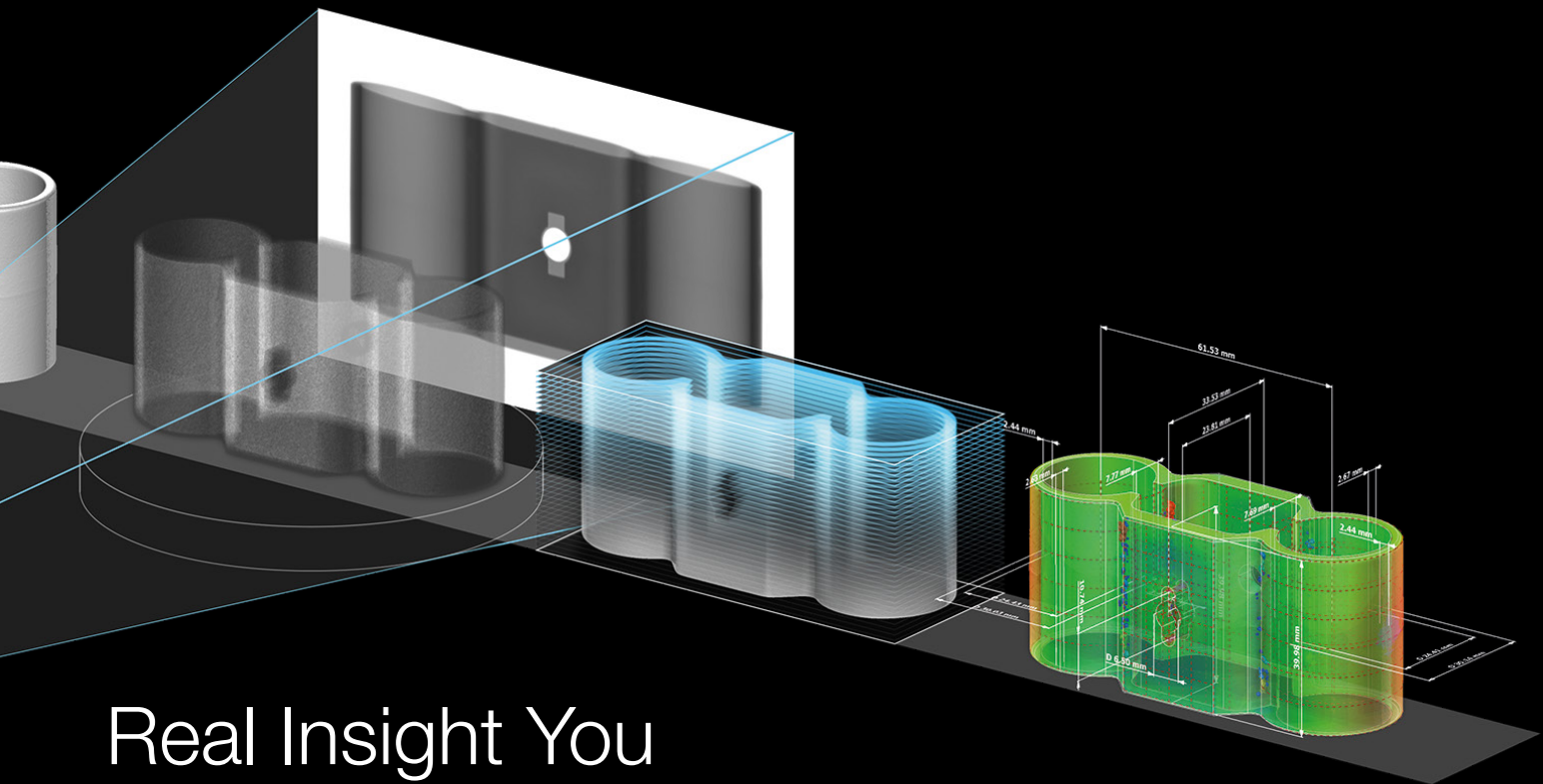
Because CT reconstruction produces a complete representation of a component in 3D based on a large number of 2D X-ray images, CT allows you to answer even the most complex questions on the external and internal structures of a component and its material properties. The process of CT scanning is fast, sensitive, reliable, non-contact, and non-destructive. You can apply it at any stage of production, from prototyping to even testing inline on the shop floor.

With its fully integrated CT reconstruction function, Volume Graphics offers a seamless connection to the comprehensive analysis and measurement functions of its software.

Moreover, the software works equally well with different CT systems from different manufacturers. Most major CT system providers sell Volume Graphics software together with their hardware. In addition, we rely on a worldwide network of distributors to serve our customers around the globe.

Scan for more
information:





Real Insight You Can Rely On

By choosing Volume Graphics software, you can rely on more than 20 years of experience in the development of software for non-destructive testing and metrology. Today, a broad range of global customers from the automotive, aerospace, and electronics industries, among others, use Volume Graphics software for quality assurance in product development and production. For this ever-growing community of users, Volume Graphics is the software of choice.

Around the world, customers put their trust in Volume Graphics—not only in our insightful software, but also in our comprehensive consulting, support, and training. Volume Graphics gives its customers a decisive advantage: the ability to gain reliable insights and make better products.

Join them.

Recognized Market Leader

Frost & Sullivan, a leading market research and consulting firm, recognized Volume Graphics in an independent benchmark analysis as market leader in the CT software sector with a market share of about 80 percent in 2017. For its “strong overall performance,” “its singular contributions toward consistently advancing the CT systems market,” and a “thorough understanding of end users’ needs,” Volume Graphics has earned Frost & Sullivan’s 2018 Market Leadership Award.*

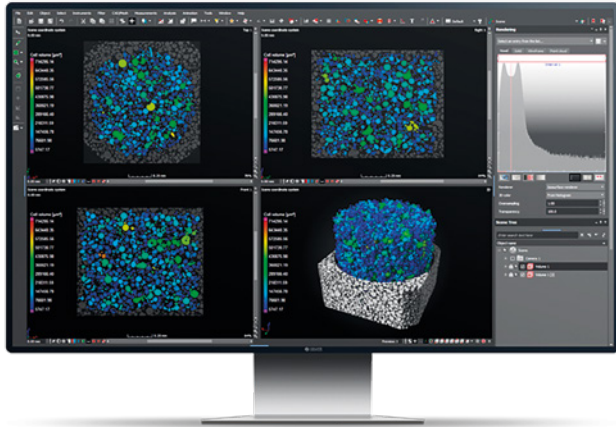


* Source: Frost & Sullivan
Award Write Up
volumegraphics.com/en/frost

Your Comprehensive Toolbox

Measure, Inspect, and Simulate—All with One Software

VGSTUDIO MAX is your tool for identifying the most important 3D printing defects—from raw material to the post-processed end product. Perform powder and meltpool data analyses, take dimensional measurements of all surfaces—even if they are inside your additively manufactured part—and find defects of all shapes and sizes.

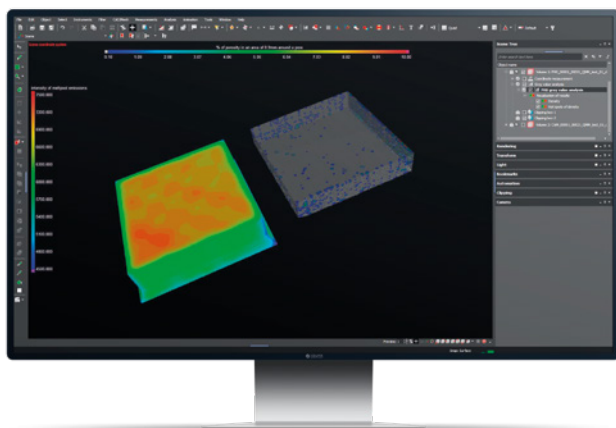


Powder Analysis

Powder is the base for many additively manufactured parts. The size and shape distribution of new and recycled powder particles influences the build process: it affects how powder gets distributed, influences the melt process, and can cause defects in the final part. With VGSTUDIO MAX, you can analyze grain contaminations, trapped air, grain sizes, and shapes—automatically for tens of thousands of particles.

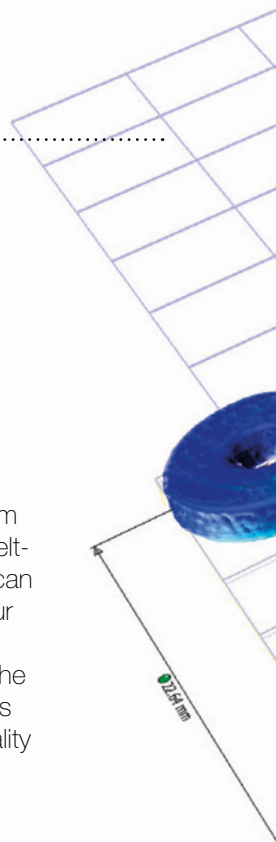
Dimensional Measurements

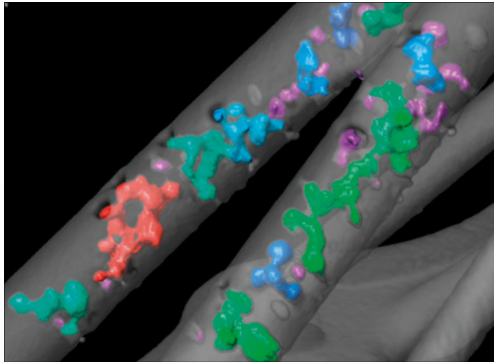
Dimensional variations also occur in additively manufactured parts, which can lead to complex warpage. VGSTUDIO MAX gives you a full suite of measurement tools ranging from complex alignments to customizable measurement reports. Dimensions and GD&T analyses can be automated and applied to CT and mesh data. Together with 3D comparisons, wall thickness, and surface profile analyses, VGSTUDIO MAX provides full first article inspection capability, helping to certify your additive manufacturing process. VGSTUDIO MAX can also measure geometries resulting from 3D-printing simulations, which helps you choose the right parameters for your 3D-printing job.



Meltpool Analysis

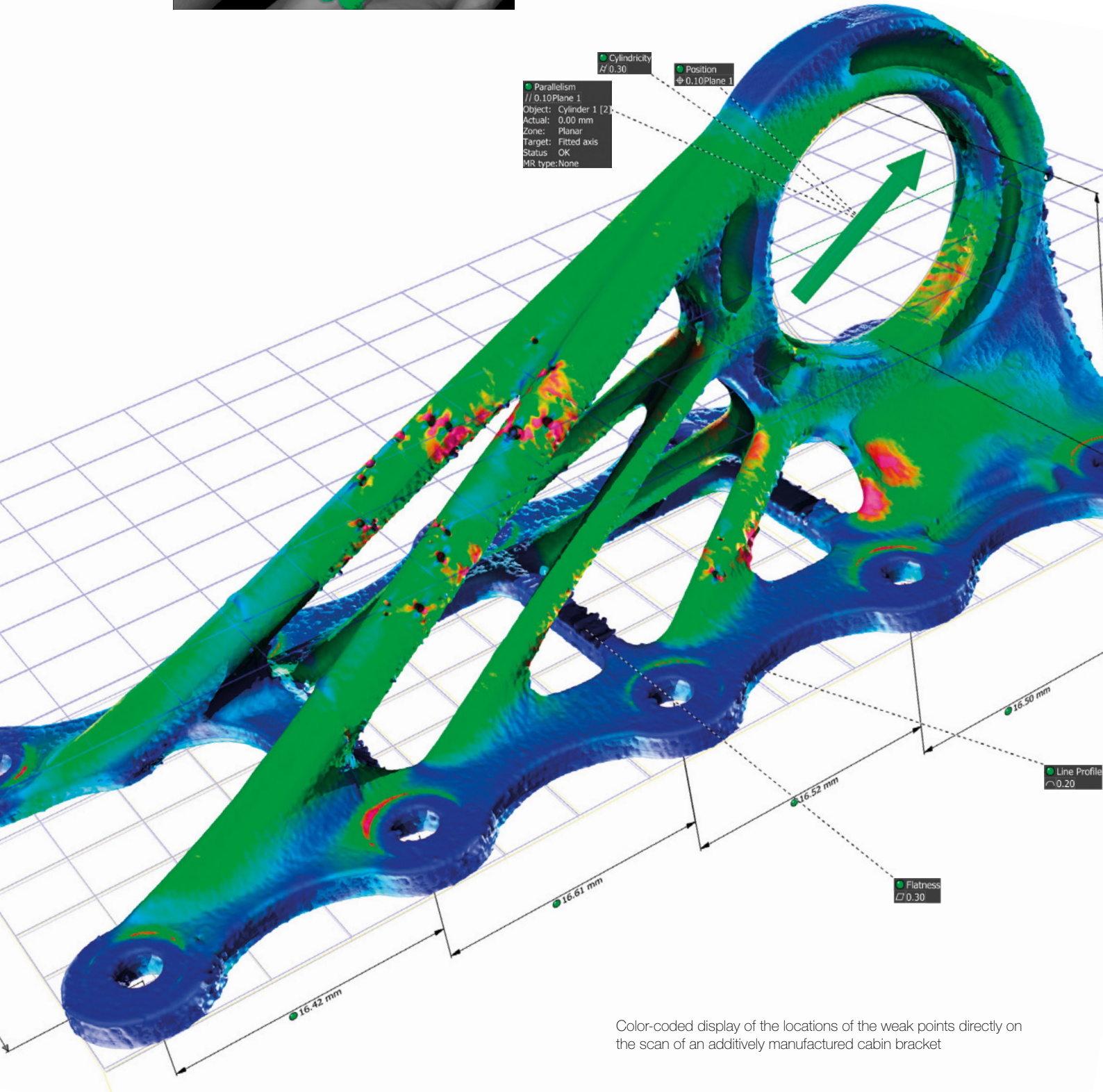
The meltpool data delivers information from every build layer, starting right from the melting process. With VGSTUDIO MAX, you can 3D-visualize the images generated by your additive manufacturing system's meltpool monitoring, analyze it, and compare it to the part's CT data. When process irregularities are detected, you can check the part quality in the CT results.



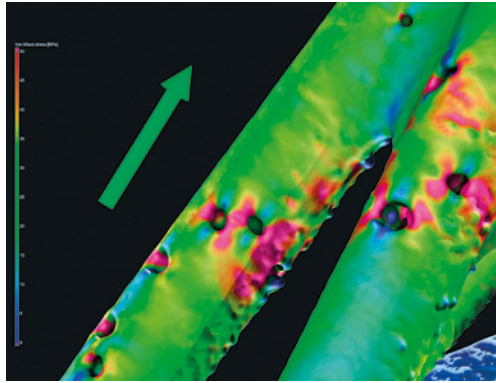


Porosity and Defect Inspection

Metal printing based on powder comes with challenges like voids, porosity, and cracks in the final product. With VGSTUDIO MAX, you can identify individual voids and inclusions and determine their sizes and shapes. Filtering of the defects by properties such as sphericity, compactness, or distance to surface allows you to distinguish between defect formation mechanisms.

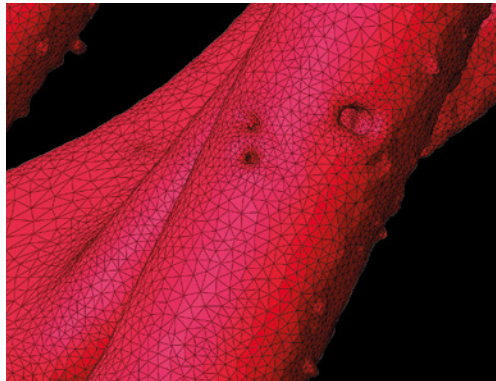


Color-coded display of the locations of the weak points directly on the scan of an additively manufactured cabin bracket



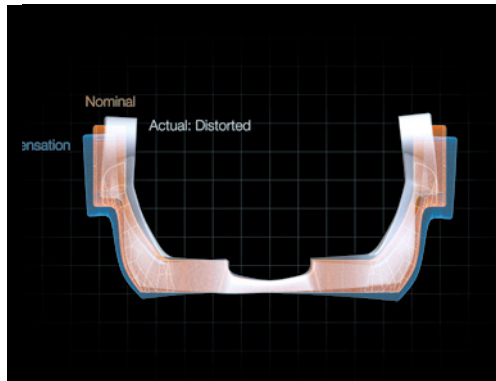
Structural Mechanics Simulation

VGSTUDIO MAX enables you to perform structural mechanics simulation (SMS) directly on CT scans. Loads and constraints are applied to the CT-scanned model, not just the CAD file. Stress concentrations due to geometrical flaws and pores can be simulated and visualized without volume meshing.



Volume Meshing

For simulation in third-party software, high-quality tetrahedral volume meshes representing the actual geometries and internal defects of the printed parts can be generated. Without intermediate surface meshing, this will avoid the loss of geometry information. Each cell of the generated volume mesh can be loaded with additional information required for simulation, such as porosity volume fractions, gray values (e.g., meltpool data), fiber orientations, and fiber volume fractions.



Mesh Compensation

In many 3D-printing technologies, part warpage and shrinkage are a regular challenge. With VGSTUDIO MAX, you can visualize and compensate for the displacement between the intended part geometry and the measured surface mesh (from a CT or optical scan) of your part. The generated compensation mesh can be used to eliminate deviations and reduce iterations to achieve the required part geometry.

Scan for more information:



Volume Graphics Advantages

Instructive Results and the Ability to Establish Efficient Workflows for All Your Tasks



Comprehensive

- > Comprehensive scope of functions for metrology and defect detection in one software
- > Measurement of inner and outer geometries and defects
- > Microstructure analysis for both powders (grain sizes, defects) and printed components (printing layers, unmolten material, defects)

Instructive

- > User-defined filtering of relevant defects, e.g., by size or shape, to distinguish between defect formation mechanisms
- > Calculation of defect size relative to local wall thickness
- > Stress simulation directly on the CT scan to determine the effect of porosity on mechanical strength
- > Comparison of meltpool and CT data

Efficient

- > Automated execution of measurement plans and defect detection
- > Seamless transition from manual and semi-automated analyses in the lab to fully automated quality assurance in production, including optional manual operator review

Related Products

- > VGSTUDIO MAX
- > VGSTUDIO MAX Additive Manufacturing Package
- > Coordinate Measurement Module
- > Manufacturing Geometry Correction Module
- > Porosity/Inclusion Analysis Module
- > Fiber Composite Material Analysis Module
- > Foam/Powder Analysis Module
- > Structural Mechanics Simulation Module
- > Volume Meshing Module

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Volume Graphics GmbH has subsidiaries in the US, Japan, China, and Singapore. To broaden our global footprint even more, we can rely on a worldwide network of distributors.

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