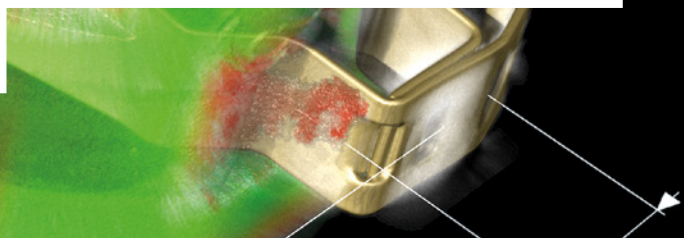


Quality Control in Injection Molding

with Volume Graphics Software



Get Full Control from Mold to Part

with Volume Graphics Software

When you inspect safety-relevant components, every little detail counts. From mold to injection-molded part, from part design to inspection—Volume Graphics software gives you the insights to constantly push the quality boundaries of your plastic parts and establish efficient workflows. The software runs on data provided by the latest computed tomography (CT) technology.

Volume Graphics software enables you to identify the most important injection molding defects, whether caused by the mold or the injection molding process—quickly, easily, and with incredible accuracy. No matter how complex the shape might be, Volume Graphics allows you to sign off on processes and accurately inspect your plastic or composite parts.



Why CT?

The Most Advanced Technology for
3D Inspection

Computed tomography (CT) data provides a comprehensive view of the injection-molded part because it 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. In combination with VGSTUDIO MAX, CT offers the unique possibility of getting a full understanding of a part's quality.

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:



Your Comprehensive Toolbox

Measure, Inspect, and Optimize—All with One Software

Volume Graphics supports you in all phases of injection molding, from part design and process simulation to automated inspection. With VGSTUDIO MAX, you get a comprehensive software that offers tools for geometric dimensioning and tolerancing, mold cavity correction, wall thickness analysis, nominal/actual comparison, porosity and inclusion analyses, tool optimization, volume meshing, and fiber analyses.

Dimensional Measurements

Dimensional deviations are a typical problem of all manufactured parts. Especially in injection molding, you need to measure warpage and shrinkage in the design and manufacturing phase. VGSTUDIO MAX gives you all the functionality of a physical coordinate measurement machine and more. Geometric deviations of your scanned injection-molded part from its respective CAD data set become visible at a glance when you perform a nominal/actual comparison.

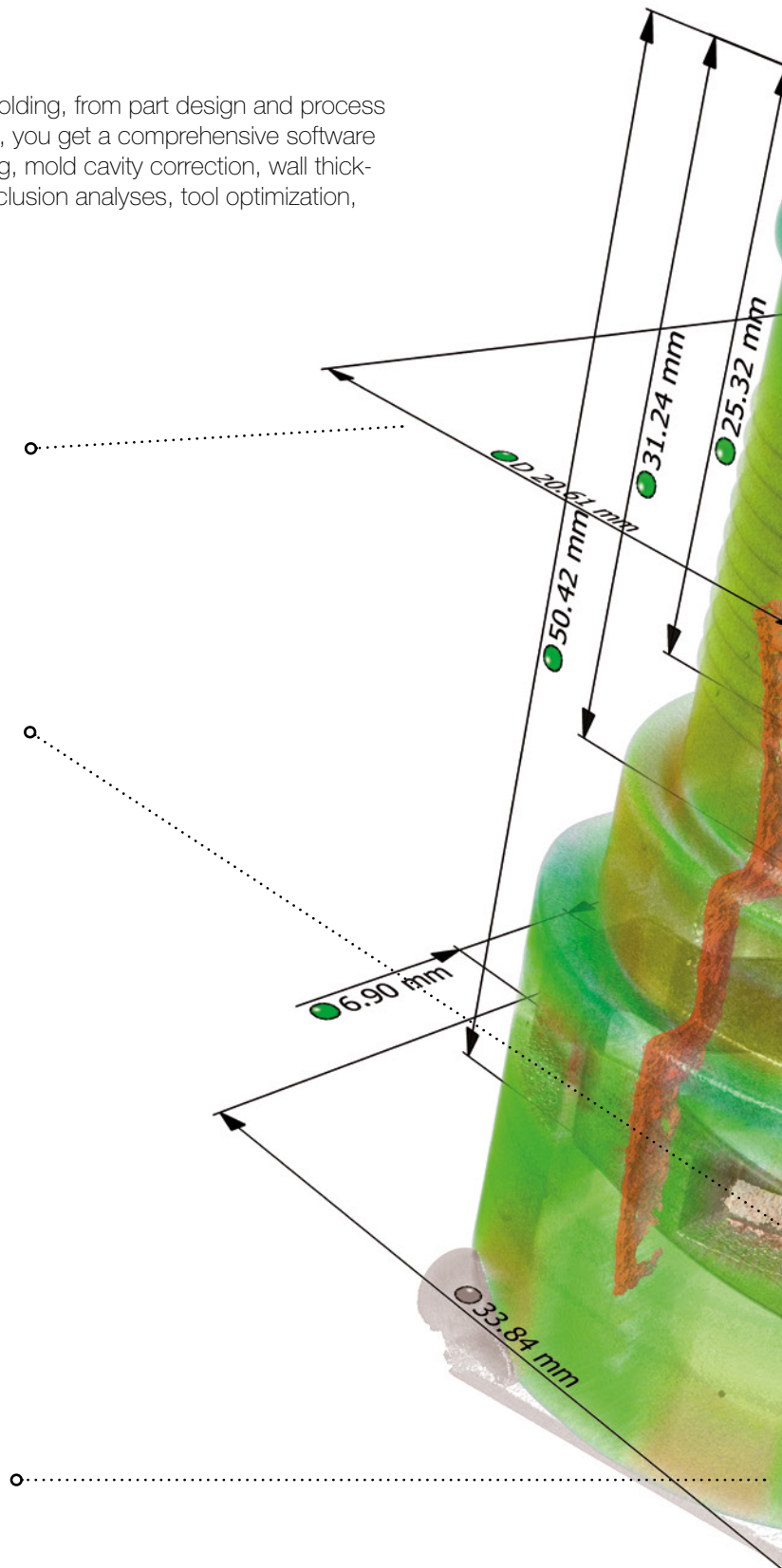
The multi-material surface determination function makes geometric dimensioning and tolerancing of multi-material objects, such as the position of metal pins of a connector relative to the plastic housing, a breeze.

By directly importing Product and Manufacturing Information (PMI), which is generated by many current CAD systems, VGSTUDIO MAX saves you a considerable amount of time when you prepare measurement plans.

And to centrally store your analysis results in quality management or statistical process control software, VGSTUDIO MAX allows you to export global results of analyses (nominal/actual comparison, wall thickness analysis, porosity/inclusion analysis, and fiber composite material analysis) in the widely used Q-DAS data exchange format.

Nominal/Actual Comparison

Shrinkage and warpage effects are often challenging to measure with classical coordinate measurement tools. The nominal/actual comparison allows you to measure local deviations between the CAD model and the manufactured part. You can visualize the deviations in 2D and 3D using color overlays and needle plots to easily detect critical regions and rework your mold—for parts with very complex geometries and undercuts.





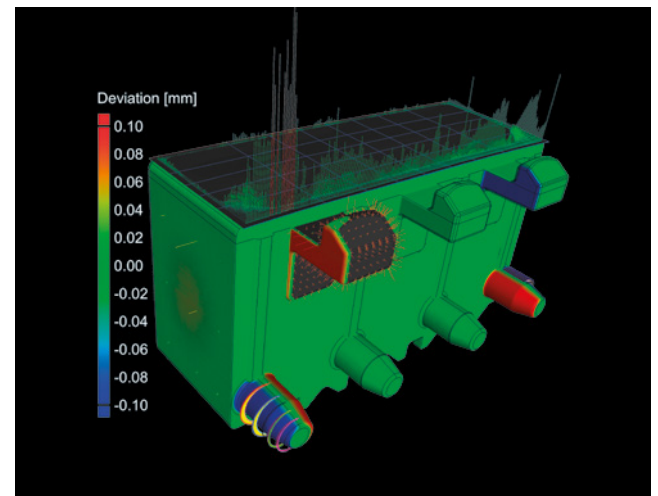
Porosity and Inclusion Analyses

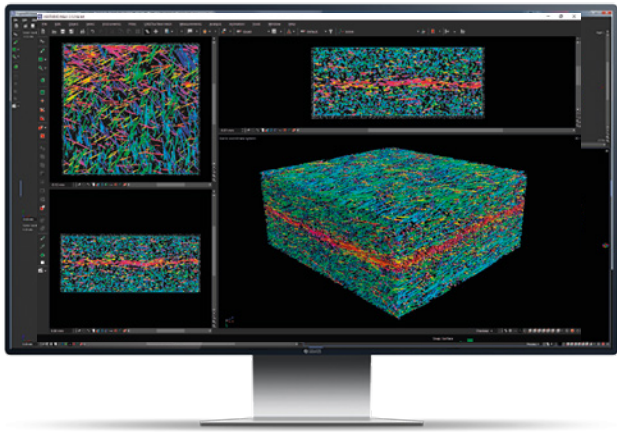
No matter if undesired cavities origin from material shrinkage in thick regions of a component, contaminated pellets, or entrapped air at the melt front: With VGSTUDIO MAX, you can locate pores, holes, cracks, and inclusions and get detailed quantitative information and statistics on these discontinuities.

Tool Optimization

Deformation in injection moldings can have many reasons, such as inadequate cooling, residual stresses, demolding or remaining stress from varying product thickness, or forming shrinkage rates.

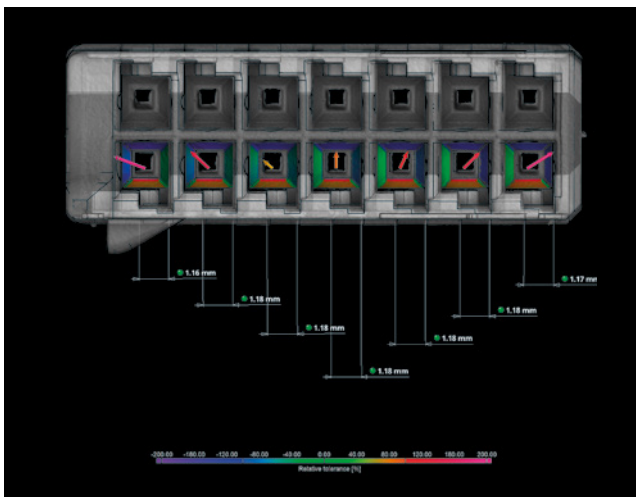
VGSTUDIO MAX analyzes the deviations to provide a compensated geometry for the moldmaker to optimize the tool. This can be done by compensating single defined points to imitate the CMM-based workflow and parametrically update surfaces that are based on these points. It's also possible to compensate sections, rigidly optimize the position of single canonical surfaces and entire patch compounds, create freeform surfaces to compensate for warpage, and export a compensated geometry for the moldmaker. By adding the compensated warpage deviation to the shrinkage information, the output can be used for updating and optimizing the mold with minimal tool rework.





Fiber Analyses

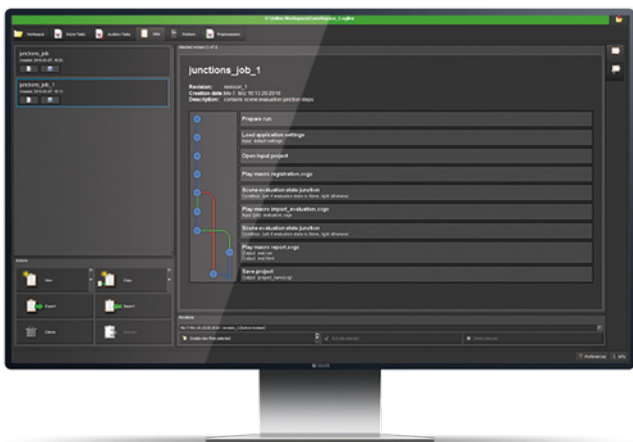
Injection molding of fiber-reinforced compounds requires the control of the fiber orientations that determine the mechanical properties of the component. Fiber orientations and fiber volume fractions can be derived from CT scans and mapped onto volume meshes originating from VGSTUDIO MAX or an external software such as PATRAN®, NASTRAN®, or ABAQUS®. Results can be used either for fitting and validating flow models from injection-molding simulations or for direct use in FEM simulations. A dedicated format for export to Digimat® is available.



Efficient Repetitive Inspections

Mass-produced components, as they occur in injection molding, lead to repetitive analysis tasks. VGSTUDIO MAX allows you to save valuable time by automating them.

To efficiently analyze multiple cavities of a connector, you can copy measurement plans and analyses (e.g., a defect analysis, nominal/actual comparison, or wall thickness analysis) from one cavity to a periodic cavity pattern in one go. For the efficient inspection of multiple identical parts, you can apply macros to multiple identical objects in one scene. Multiple identical parts in separate (.vgl) files can also be efficiently analyzed using batch processing.



Automated Inspection in Production

It is becoming increasingly important for parts to be inspected as comprehensively and non-destructively as possible directly where they are produced. With VGinLINE, you can semi- or fully automate the quality control process of plastic parts (including the automatic recognition of tool cavity markers).

VGinLINE is a ready-to-use framework that relies on the advanced capabilities of VGSTUDIO MAX. It can cover the entire process from the reconstruction of the CT data to inspection, reporting, and manual review. Its modular architecture makes it easy to tailor it to specific scenarios. You can combine analyses and any other required data, such as report configurations or reference models, into a single inspection plan, which you can edit in VGSTUDIO MAX and execute in VGinLINE.



Scan for more information:

Volume Graphics Advantages

Inspect Your Parts Using One Accurate, Comprehensive, and Connected Tool



Related Products

- > VGSTUDIO MAX
- > VGSTUDIO MAX Composites & Plastic Package
- > Coordinate Measurement Module
- > Wall Thickness Analysis Module
- > Nominal/Actual Comparison Module
- > Porosity/Inclusion Analysis Module
- > Fiber Composite Material Analysis Module
- > Manufacturing Geometry Correction Module
- > Volume Meshing Module
- > VGinLINE

Learn More

Learn more at www.volumegraphics.com/im or by scanning the QR codes.

Accurate

- > Unique locally adaptive and subvoxel-accurate surface determination, with accuracy verified in numerous studies
- > Surface representation directly on the CT data—no loss of accuracy from conversion to a surface mesh
- > PTB- and NIST-verified fitting of geometry elements on CT data

Comprehensive

- > Comprehensive scope of functions for metrology, mold cavity correction, fiber compound analyses, and defect detection in one software
- > Measurement of inner and outer geometries—no spray, no stickers needed
- > Measurement in single- or multi-material parts and even assemblies
- > Handling of point cloud, mesh, and voxel data

Connected

- > Import of PMI measurement plans directly from CAD models
- > Fully digital tool correction workflow between design, metrology, and tooling
- > Mapping of fiber orientations and fiber volume fractions onto existing volume meshes for FEM simulations or validation of molding simulations
- > Communicates with external quality systems through its reporting engine

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