



part of Hexagon

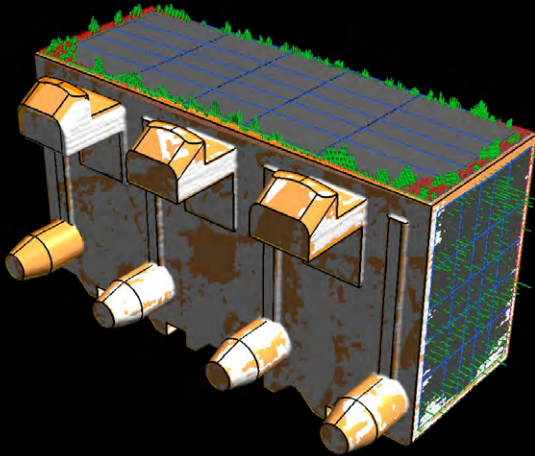
What's New in VGSTUDIO MAX

Discover the Exciting New Capabilities of Version 3.5
(as of May 2021, Version 3.5.0)



Building on the innovations of version 3.4.x, you will benefit from the following new capabilities* in version 3.5.0:

Manufacturing Geometry Correction



Finding Points to Compensate

When compensating a geometry, a new filter option allows you to find fit points that cause inaccurate compensation results.

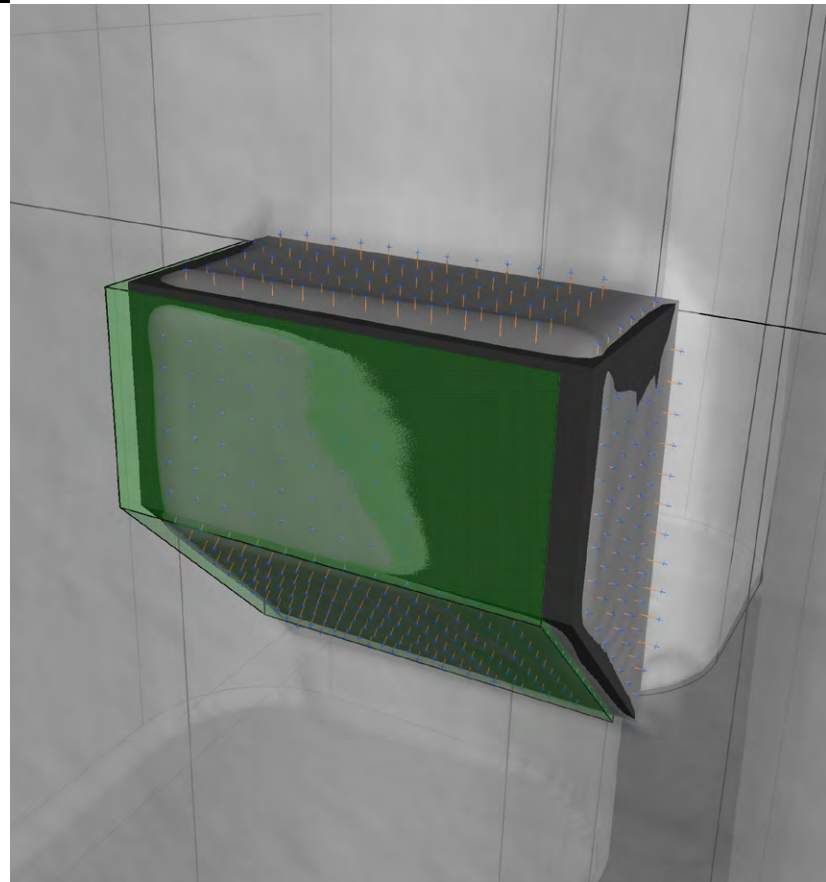
Compensating sections for closed geometry, such as cylinders, cones, or more complex cavities sections, gives you better control over compensated results for complex geometries that are derived by a loft (a function to create a surface or solid from a set of curves) in the CAD system, addressing draft angles better than a freeform surface.



Ways to Compensate

The option to rigidly compensate geometry elements allows you to compensate canonical geometries with more control over size and orientation. If you want to compensate a geometry, such as a datum plane, you can now add a constraint to move the plane to the best possible position without changing its shape or normal, all while maintaining manufacturability.

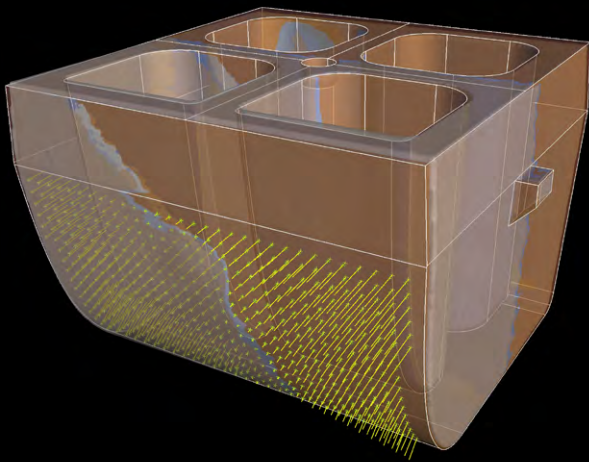
Also, you can now rigidly relocate patch compounds with constraints. This allows you to compensate areas consisting of a set of patches while keeping their continuity when you move them to an optimal compensation position, which ensures manufacturability. The compensated area will be easier to build back into the CAD model. You can control all degrees of freedom.



*Please note: Depending on the platform, there are differences in the range of functions for different operating systems. See our continuously updated Product Information page for details: www.volumegraphics.com/en/support/product-information.html

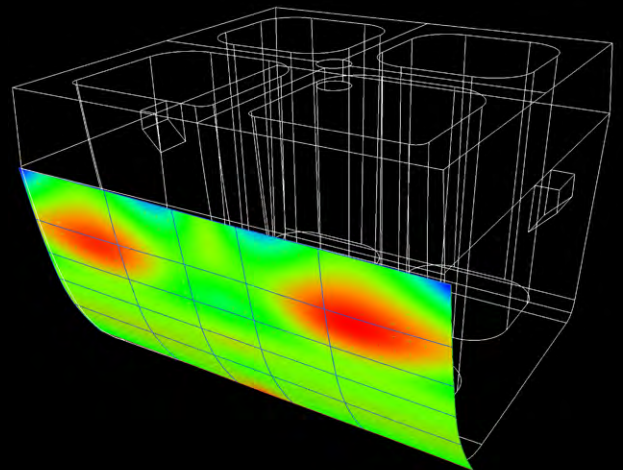
Visualization of Compensated Points

The visualization of compensated points give you a visual feedback on the results when compensating a geometry, allowing you to better interpret used parameters.



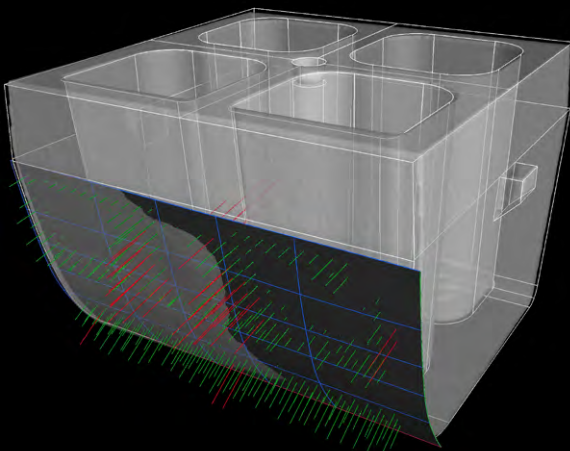
Fitting Surfaces to Compensated Points

Get better fitting results for any freeform surface. The improved surface fitting with user-controlled smoothness of surface offers better output quality and greater user friendliness.



Receive visual feedback on the quality of the surface compensation by visualizing deviations between points and surface. Hairlines now indicate areas in and out of tolerance and allow for a better interpretation of used parameters.

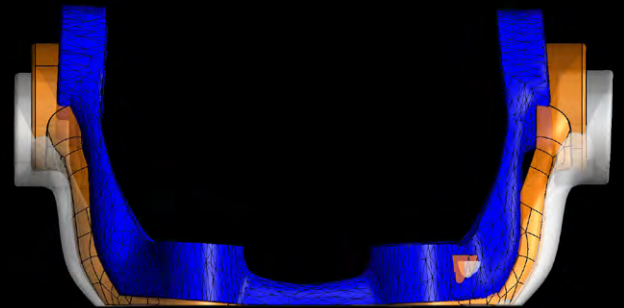
You can instantly see how your changes affect surface fitting. The surface, which depends parametrically on the filtered points, will update in real time if the settings change. Real-time surface fitting improves your user experience and speeds up your workflow.



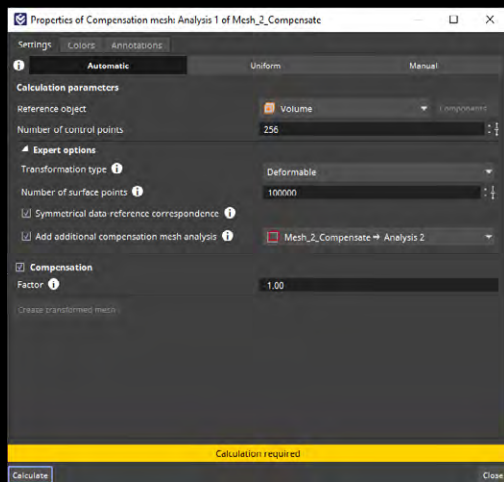
Mesh Compensation (Part of the Manufacturing Geometry Correction Module)

Compensation Mesh for Additive Manufacturing

Easily create a surface mesh that compensates for the difference between the actual object and a reference object. Since version 3.4.5, this feature saves you time by reducing the number of iterations as opposed to a trial-and-error approach for the final printing geometry optimization. You can compensate the mesh sent to a 3D printer to eliminate deviations caused by distortions in the nominal geometry. Such distortions are inherent in the 3D printing process and may even remain after a previous optimization based on a 3D printing simulation.



3D



Improved Mesh Compensation User Interface

In version 3.5, the user interface for mesh compensation has been redesigned to improve your user experience for existing capabilities while adding new features.



Compensation Mesh Color Overlay

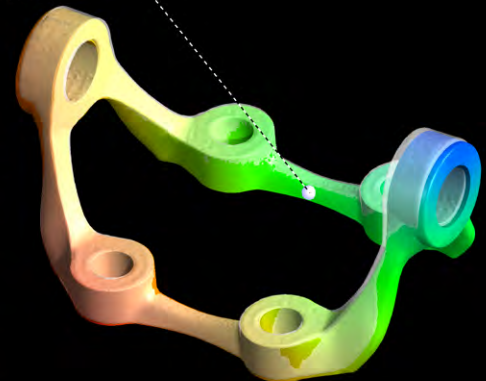
A new compensation mesh color overlay helps you clearly visualize the displacement in the compensation mesh, allowing you to analyze and annotate displacements.



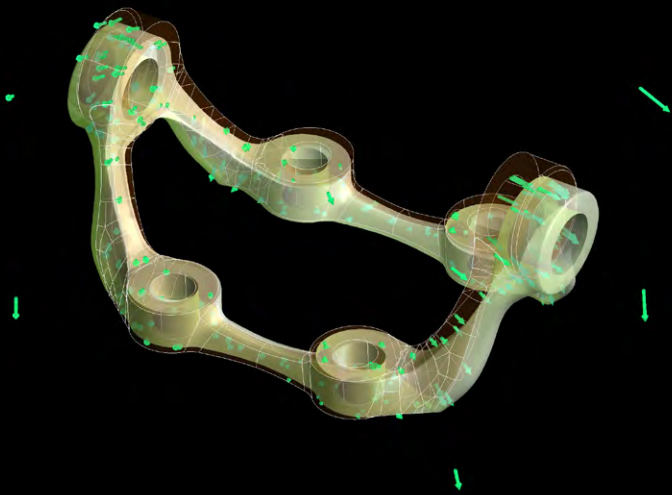
Cursor 1
Position [mm] -0.88 15.48 1.23
Transform distance value on surface [mm] 1.21

Displacement [mm]

2.56
2.30
2.05
1.79
1.53
1.28
1.02
0.77
0.51
0.26
0.00



3D



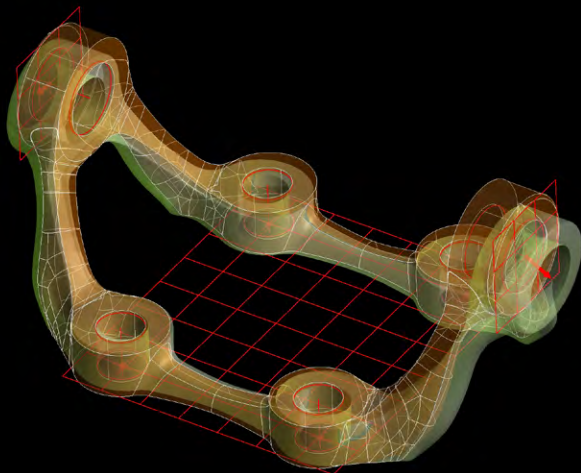
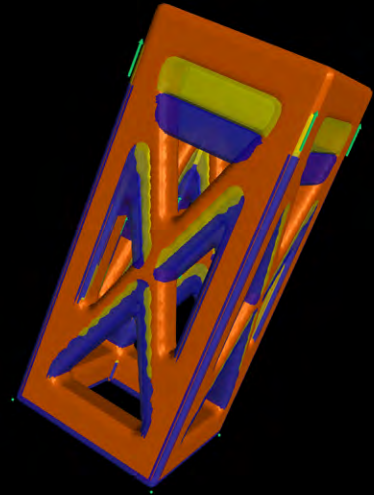
Control Points and Compensation Vectors Visualization

Gain a better understanding of the behavior of the model by visualizing control points and compensation vectors/deformations.



Better Results for Large Deviations

Get more stable and reliable results when working with scan and reference objects that differ greatly in size or show other significant deviations.



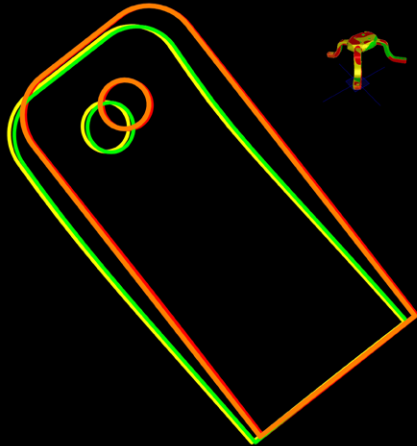
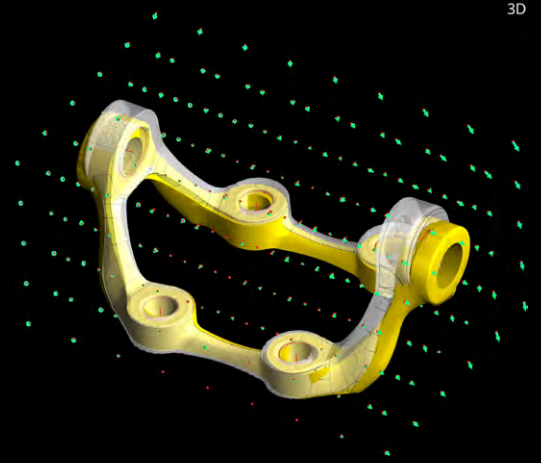
Manual Control Points Placement

If the automated placement of control points does not deliver the desired results, you now have the option of manually defining the placement of control points used for compensation using geometry elements and defined points.



Uniform Control Points Placement

For more reliable results on complex parts, you can now use a new uniform control point placement mode. It improves control point placement in situations where the location of control points has not been properly determined or features are uniformly spread out in the model.



Iterative Compensation Process

Add up compensation mesh results for an iterative compensation process. This addition of results helps when one iteration does not fully compensate the deviation.



ROI as Reference Object

When only a part of the model needs to be compensated, you can now use ROIs to limit compensation on a specific area.



More New Mesh Compensation Features

- Compensated mesh visualization in the Scene Tree: For easier navigation and a better understanding of the relation between elements, deformed meshes are now visualized as part of the analyses in the Scene Tree.
- Faster compensation mesh updates: After the first calculation, updates calculate roughly 10 times faster, providing quicker previews of calculation results when parameters are changed and allowing you to find suitable compensation parameter settings faster without creating unnecessary objects in the Scene Tree.

- No set number of maximum control points: More control points allow for a more granular and accurate compensation of very complex parts, such as lattice structures, or parts with a high number of small features. By removing the maximum number of control points, the maximum number of control points is now mainly limited by the processing power of your system and can be as high as 1000 (instead of 100 in previous versions).



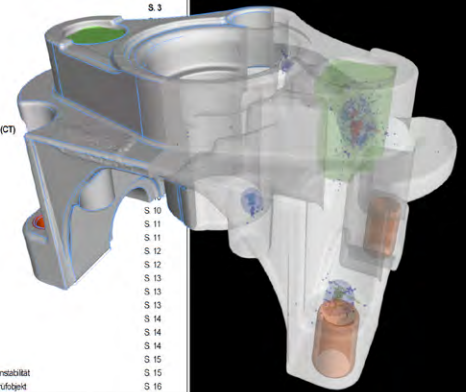
Support of BDG Reference Sheet P 203

Inspect cast parts for porosity according to the Reference Sheet P 203 of the Federation of German Foundry Industry (BDG). Starting with version 3.4.5, the Extended Porosity/Inclusion Analysis Module supports the BDG P 203 analysis. With the help of the porosity key according to BDG P203, you can now perform a 3D evaluation of detected volume deficits both in the complete casting and in freely defined sub-areas, such as functional areas with special attributes. Together, VGSTUDIO MAX and Q-DAS qs-STAT now cover the complete loop—from specifying porosity tolerancing criteria according to BDG P 203 by the product designer to statistical process control by the quality engineer:

- **Generate porosity keys** via an intuitive interface, define a reference volume according to the inspection plan using the ROI functions of VGSTUDIO MAX, and get a quick overview of all global tolerancing criteria and results for the BDG P203 analysis.
- **Evaluate volume deficits** and independently tolerance different ROIs in one BDG P 203 analysis, flexibly combine the tolerancing and filtering of discontinuities based on their characteristics, and evaluate freeform reference volumes (ROIs) within the object's boundaries (surface).
- **Document BDG P 203 analysis results** by using "Reporting via Excel"—or the new integrated reporting function.
- **Export BDG P 203 analysis results to Q-DAS** to qualify and statistically analyze your casting processes.



BDG – Richtlinie		P 203
		Stand: 12. Dezember 2019
Porositätsanalyse und -beurteilung mittels industrieller Röntgen- Computertomographie (CT)		
INHALT:		
1	Geltungsbereich	S. 2
2	Mitglieds Normen und Richtlinien	S. 3
3	Abkürzungsverzeichnis/Glossar	
4	Erläuterung innere Volumendefekte	
4.1	Schwindporosität (Lunkler)	
4.2	Schwammartiges Gefüge	
4.3	Gasporosität	
4.3.1	Thermomechanisch bedingte Gasporosität	
4.3.2	Strömungsmechanisch bedingte Gasporosität	
4.3.3	Formstoffbedingte Gasporosität	
5	Messmethode Röntgen-Computertomographie (CT)	
5.1	Grundlagen und Terminologie	
5.2	Detailelementarstrahlige Voxelgröße	
5.3	Aufsätze	
5.3.1	Strahlzuführungseffekte	
5.3.2	Strahlstreuungseffekte	
5.3.3	Weitere Aufsätze	S. 10
5.4	Verfahren zur Artefaktreduzierung	S. 11
5.4.1	Röntgenverfälschung	S. 11
5.4.2	Numerische Strahlzuführungskorrektur	S. 12
5.4.3	Dual Energy-CT	S. 12
5.5	Numerische Simulation von CT-Aufnahmen	S. 13
5.6	Anlagenqualifizierung	S. 13
5.6.1	Geometrische Korrektur	S. 13
5.6.2	Abblünderkorrektur	S. 14
5.6.3	Räumliche Auflösung	S. 14
5.6.4	Kontast- und Rauschgeschichten	S. 14
5.7	Prüfverfahren	S. 15
5.7.1	Voraussetzungen, Detektorereinstellungen, Anlagenstabilität	S. 15
5.7.2	Überprüfung der Messqualität der CT-Daten vom Prüfobjekt	S. 16
Herausgeber: BDG, Hansallee 203, 40549 Düsseldorf Zu beziehen über: www.bdgplus.de		
		Seite 1 von 38



Key	Name	ROI	Porosity [%]	Key type	Pore count	Max. pore volume [mm ³]	Max. diameter [mm]	Max.
1	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Global	76	107.69	10.21	10.21
2	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Global	90	107.69	10.21	10.21
3	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Global	96	107.69	10.21	10.21
4	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
5	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
6	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
7	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
8	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
9	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
10	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
11	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
12	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
13	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
14	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
15	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
16	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00
17	0.000000 [0.000000] (0.000000) (0.000000)	0.000000	0.00	Freeform	9	7.65	1.00	1.00

New BDG P 203 Functions

Building on the features introduced in version 3.4.5, the BDG P 203 analysis in version 3.5 offers a streamlined user interface and an "Only Threshold" algorithm for porosity segmentation, which may be a requirement of the inspection plan. Usability improvements include combining the generation and editing of global and freeform porosity keys in one dialog and a new BDG P 203 name field that allows you to add a comment for each porosity key.

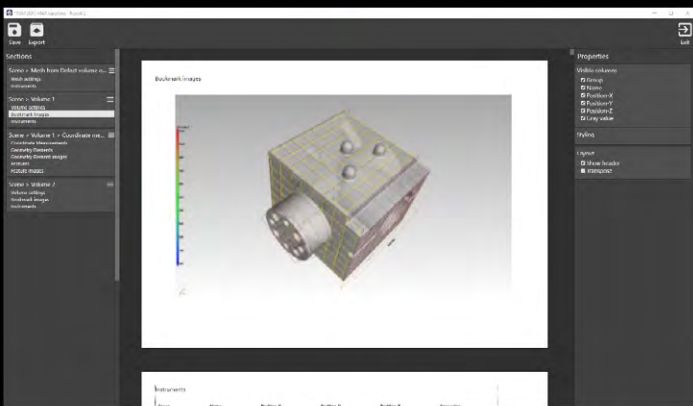
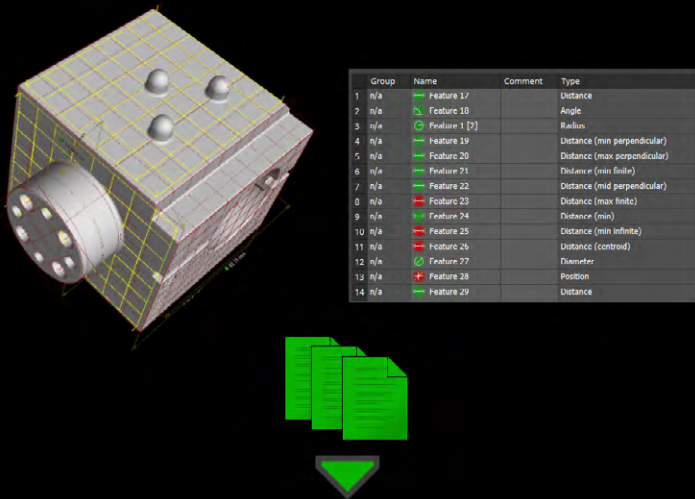


Equivalent Pore Diameter

Calculate the equivalent pore diameter for three-dimensional porosity/inclusion analyses in the analysis modes VGEasyPore, VGDefX/Only Threshold, and P 203 Analysis. Introduced in version 3.4.3, the equivalent diameter of a volume deficit is the diameter of a sphere that has the same volume as the volume deficit (for example, a gas pore or shrinkage porosity). This has the advantage of not having elongated, hose-like volume deficits with only slight compactness and/or sphericity represented as huge pores with an excessively large pore diameter.



Reporting and Traceability



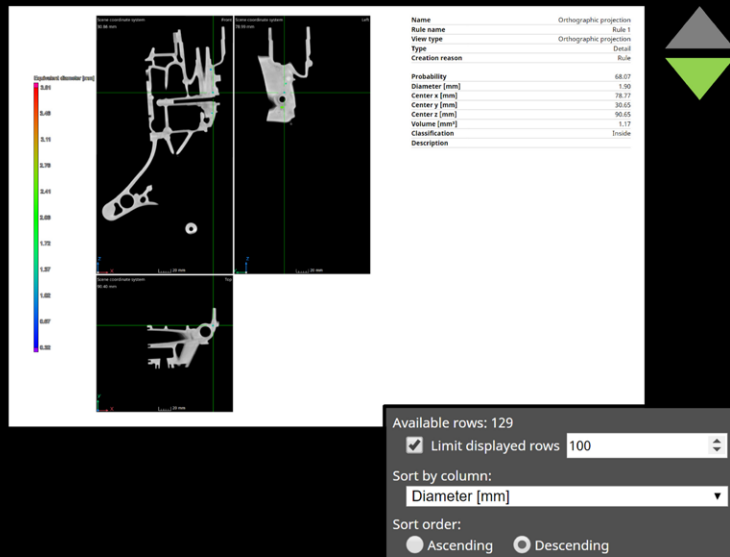
New Integrated Reporting

Edit and view reports in Volume Graphics applications exactly as they would appear in the PDF. The completely new integrated reporting function introduced in version 3.4.4 lets you customize reports, automate their creation, and store them directly in your .vgl project:

- **The new integrated reporting function** is a fast way to create presentable .pdf reports without having to switch to external software, such as Microsoft Excel, and is available across our products, even in our free viewer applications myVGL and VGMETROLOGY VIEWER. And because creating and exporting reports are macro-recordable, the new reporting function is also available for automation and VGinLINE.
- **The new WYSIWYG (What You See Is What You Get) editor** makes it easy to create a more digestible view of your project data. You can create reports that contain all or a subset of the reportable content in the scene and customize the displayable content, such as images, table columns, and page layouts. Additionally, data sections in the report, like selected meta-information, volume information, analysis settings, and result images, can be reordered or removed altogether. Once a custom layout has been created, it can be stored and reused when similar content is to be reported.
- **The new reporting function is introduced as an additional option** and will be continuously enhanced in the future. Reporting via Excel will continue to be supported, while the existing integrated .html reporting with its current scope of functionality will remain available for a limited period of time.

Advanced Table Properties in Report Editor

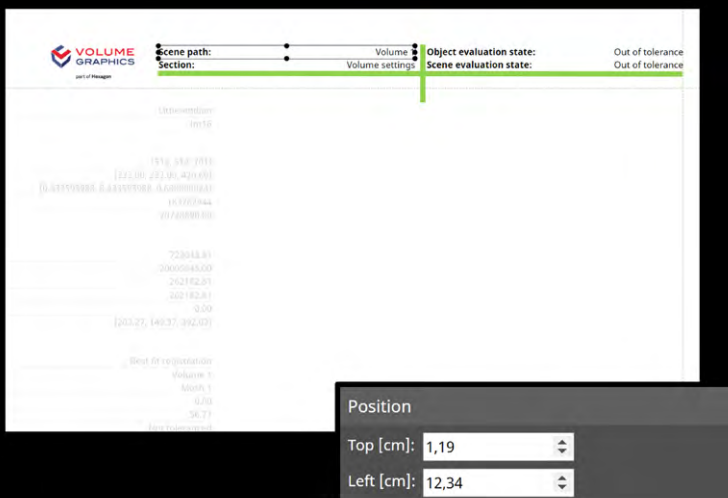
Advanced table properties in the new WYSIWYG report editor give you full control over the page count of your report and let you focus your reports on aspects that are especially relevant. While the software creates the full set of results, you can now customize the sorting of rows within tables and limit the displayed rows to display only a subset of result components (for example, defects) or control the order of images (for example, to display the largest defects first).



NEW IN 3.5.0

Ordering Page Elements in Report Editor

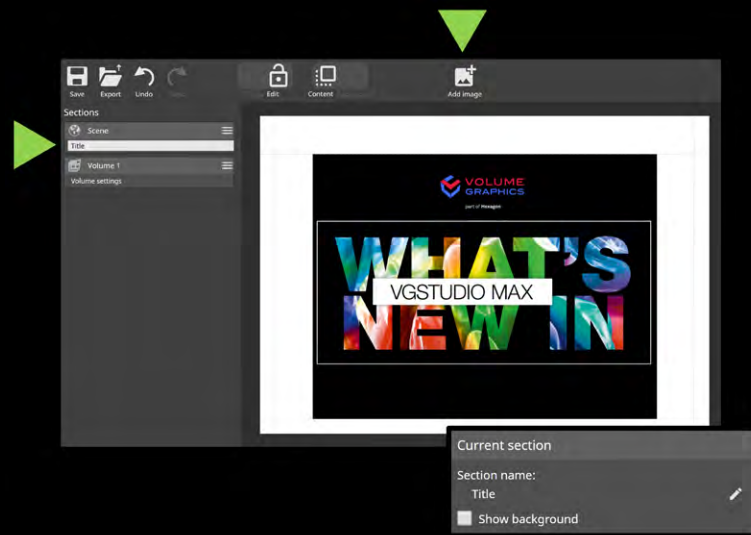
Change the order and position of elements on a page to create customized report layouts in the WYSIWYG editor. You can now determine the element positions by entering numerical values, which comes in handy when you want to align elements with each other or easily compose text content and graphical elements by controlling the order of elements via the context menu.



NEW IN 3.5.0

Customizable Report Sections and External Images

Customizable report sections and images from external sources give you even more flexibility for your report layouts. In the WYSIWYG editor, you can now add empty sections, rename sections to more accurately describe their content, and enable/disable the background for individual sections. By incorporating external images, you can mix content created in Volume Graphics software with relevant external content to create stunning visuals, such as for impressive title pages.



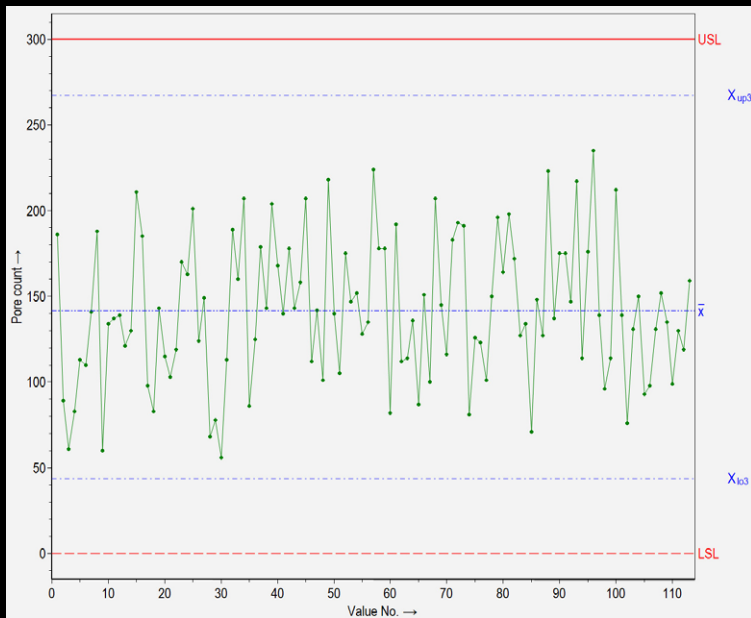
Q-DAS Export for Porosity/Inclusion Analysis Results

Use porosity/inclusion analysis results for process qualification or statistical analysis. Starting with version 3.4.5, you can export tolerated, global porosity/inclusion analysis results and related tolerances in the Q-DAS ASCII transfer format for use in statistics software, such as qs-STAT from Q-DAS.

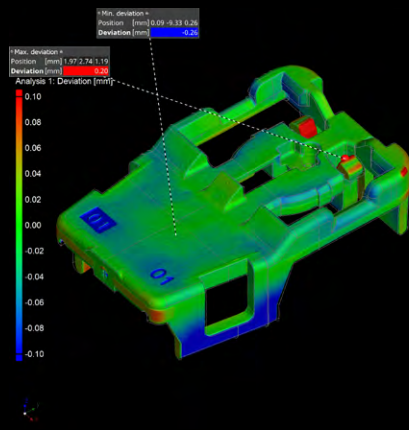


Improved Q-DAS Export for More Analysis Results

Improved Q-DAS export for tolerated, global wall thickness analysis, nominal/actual comparison, and fiber composite material analysis results allows you to easily transfer the results to statistics software, such as Q-DAS qs-STAT, for process qualification or statistical analysis.



Nominal/Actual Comparison



Automated Annotations for Min./Max. Deviations

A new option allows you to automatically create annotations for min./max. deviations when performing a nominal/actual comparison. This makes extreme points visible at a glance.



Faster Nominal/Actual Comparison Calculations

We've accelerated the calculation of nominal/actual comparisons. You'll notice generally shorter calculation times. In addition, a new preview mode, which delivers a quick color fail plot in just a few seconds, speeds up the setup of inspection plans. In addition, the option to disable statistics calculation can save you a lot of processing time, especially in in-line scenarios.



File Input/Output

TXM Volume Import

Directly import high-resolution volume data from ZEISS Xradia CT systems, including the correct settings for orientation and dimensions. Starting with version 3.4.5, support for the TXM format, which is typically used when analyzing the microstructure of material samples, eliminates the need for a time-consuming export of DICOM or TIFF on the CT system and their manual import into VGSTUDIO MAX.



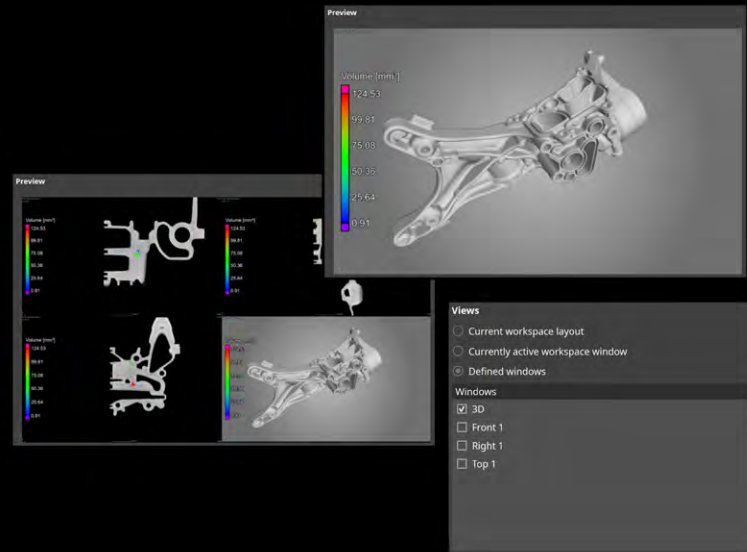
HiXCT Multiple Volume Import

Load volume data from Hitachi Industrial CT systems. Version 3.4.3 (and higher) can import files in the HiXCT format, which is typical for Hitachi Industrial CT systems. This format optionally supports volumes coming from a multi-circle scan.



Window Options when Saving Images

Save either the currently selected workspace window or a manually defined combination of workspace windows with a new save image option introduced in version 3.4.5. Depending on your manual inspection workflow, either may be more convenient for you—the new option in the dialog allows for both while keeping the shortcut and automatic storage of other image settings unchanged.



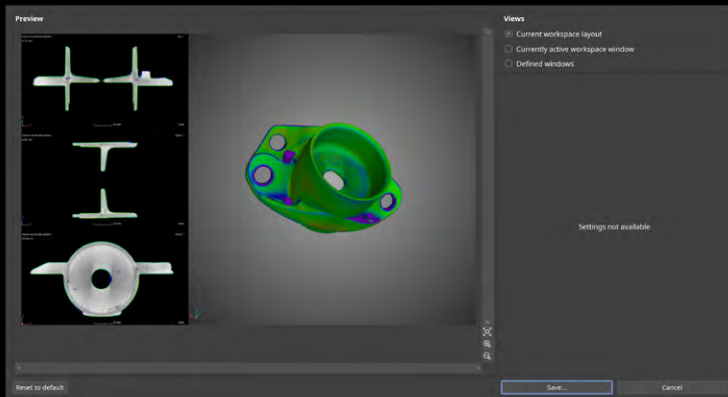
Save Image of Complete Workspace

Save an image of the complete workspace as is. Since this new save image option is WYSIWYG, the created image reflects the overall size of the workspace and maintains the exact window positioning, even for irregular layouts.



More New File Input/Output Features

- Import multiple files at once with the “Quick Import” feature: The settings chosen for a specific file type will be applied to all following files of the same type, reducing the amount of user interaction.
- Import files with drag and drop: Hold the alt key and drag the files to the application holding the left mouse button. This is much more intuitive than the previous option, which was performed with the right mouse button.



CT Reconstruction

Support of Angular Positions

Import JSON files to use actual angular positions. As of version 3.4.3, the software supports JSON files, which are based on an open, non-manufacturer-specific standard.



List of Angular Manipulator Positions

For improved image quality, it is possible to use actual angular positions of the scanned object in automated reconstruction via Project SDK in version 3.4.3 and higher.



Coordinate Measurement

“Resize Element” as New Type of Geometry Element

A new combined geometry element type called “resize element” allows you to resize a geometry element without changing its fit points. You may use this feature to make a geometry element more visible, for example, by enlarging an axis to a certain point so the element becomes visible outside of its source element.



Mirroring CAD Models

Mirror a CAD model directly in Volume Graphics software. If, for example, you need to measure a mirrored part, but only the unmirrored CAD model was provided by the designer or customer, you can now perform the mirroring without any third-party CAD software.

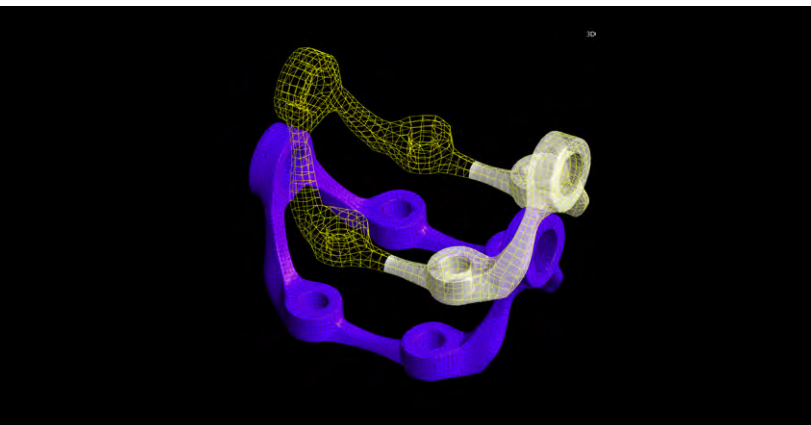


More New Coordinate Measurement Features

- Improved CAD selection speed: The visualization of just the selected surfaces without fit points allows for the much faster creation of patch compounds when selecting a high number of CAD faces and adding them to a freeform patch compound.
- Selecting all CAD patches: When selecting almost all surfaces to create a GD&T callout, it may be much quicker to select all (with Ctrl+ Middle Mouse Button) and deselect a few than manually selecting them surface by surface. This comes in handy when you have to select a high number of CAD faces and add them to a freeform patch compound.



Reverse Engineering



Quad Mesh Preview

A new option allows you to preview the quad mesh, giving you feedback on the patch layout before you start the computationally intensive creation of the surfaces.



Foam/Powder Analysis

Equivalent Cell/Grain Diameter

Calculate the equivalent cell/grain diameter for foam/powder analyses. Introduced in version 3.4.3. The equivalent cell/grain diameter is the diameter of a sphere that has the same volume as the cell or grain. It has the advantage of being easier to understand than the cell/grain volume.



Import Setting for Color Bars in Evaluation Templates

Import evaluation templates while keeping the settings for the color bar. Simply decide whether you want the global analysis color bars in the project to be overwritten by those stored in the evaluation template.



Alignment of Integration Meshes

To map data from all kinds of analyses into volume meshes, you can now change the position and orientation of the integration mesh. Aligning volume meshes according to the inspected volume objects or an externally provided coordinate system can be easily done by copying and pasting the transformation between arbitrary scene objects (e.g., volume meshes, surface meshes, CADs, and volumes).



Extended Import of ABAQUS as Integration Mesh

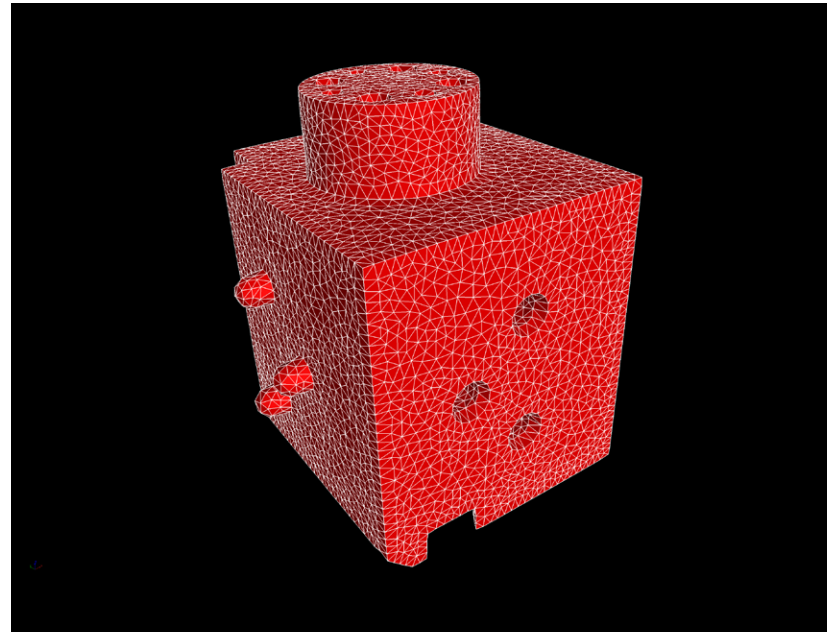
Import ABAQUS integration meshes in the .inp file format, including hexahedral elements in addition to tetrahedral elements. By broadening the interface for importing the ABAQUS .inp format in version 3.4.3, we are allowing you to map results of various analyses in VGSTUDIO MAX onto hexahedral ABAQUS FE meshes. Thus, you can enhance FE simulations with micromechanical information in software packages that support .inp files.



Volume Meshing

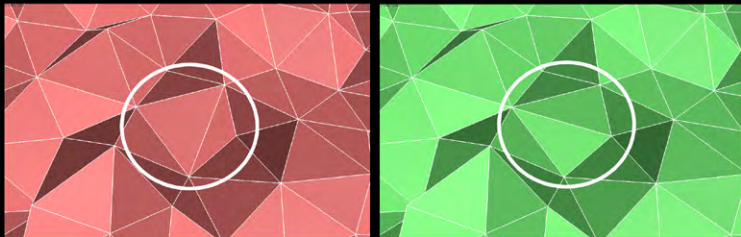
Sharp Edges in Tetrahedral Mesh Creation

Create tetrahedral volume meshes for components that contain sharp edges to get a better representation of the component geometry with a significantly reduced number of tetrahedral elements. When you activate this new option, which was introduced in version 3.4.4, the algorithm identifies sharp edges in the component and creates a mesh that reflects these edges by aligning FE nodes on them.



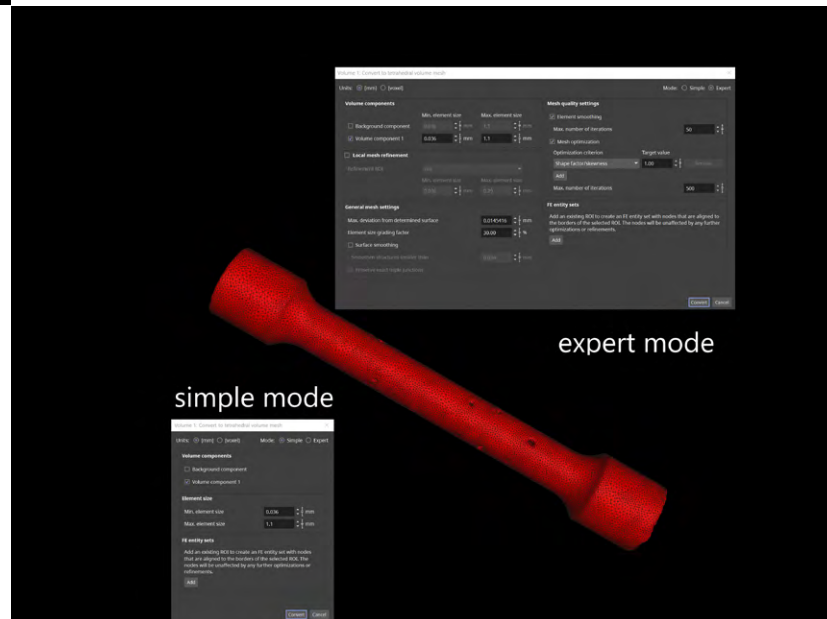
“Flip Edges” Option for Optimized Mesh Quality

Optimize element quality of tetrahedral volume meshes using the “flip edges” option. Since version 3.4.5, the algorithm allows mesh nodes to reconnect differently, which will result in significantly improved local mesh quality.



Simple and Expert Mode for Volume Meshing

Create high-quality tetrahedral volume meshes on CT data more easily. As of version 3.4.3, we've split the user interface for volume meshing into “Simple” mode for defining basic mesh properties and “Expert” mode for defining more advanced meshing options. “Simple” mode allows you to quickly and easily define the main settings, resulting in high-quality meshes for typical meshing tasks. “Expert” mode can be used to control advanced settings to further optimize mesh quality, if needed.



NASTRAN Export for Volume Meshes

Simplify your workflow when building NASTRAN simulation models based on CT data by using NASTRAN export for volume meshes. Starting with version 3.4.5, you can directly use tetrahedral volume meshes created in VGSTUDIO MAX for NASTRAN simulations without using another software, such as a FE preprocessor to convert them from PATRAN or ABAQUS formats into NASTRAN format.



Licensing

Using Floating Licenses with Previous Version

VGSTUDIO MAX and VGMETROLOGY floating licenses can now be used with the previous version, allowing you to install a new floating license file on the floating server without being forced into upgrading all clients at the same time. This makes the update process much easier when you want to upgrade many floating workspaces to a new major version. Backwards validity is available for VGSTUDIO MAX and VGMETROLOGY 3.4.4 and higher.



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