ImportGeo-Base

User Guide

GeoDict release 2022

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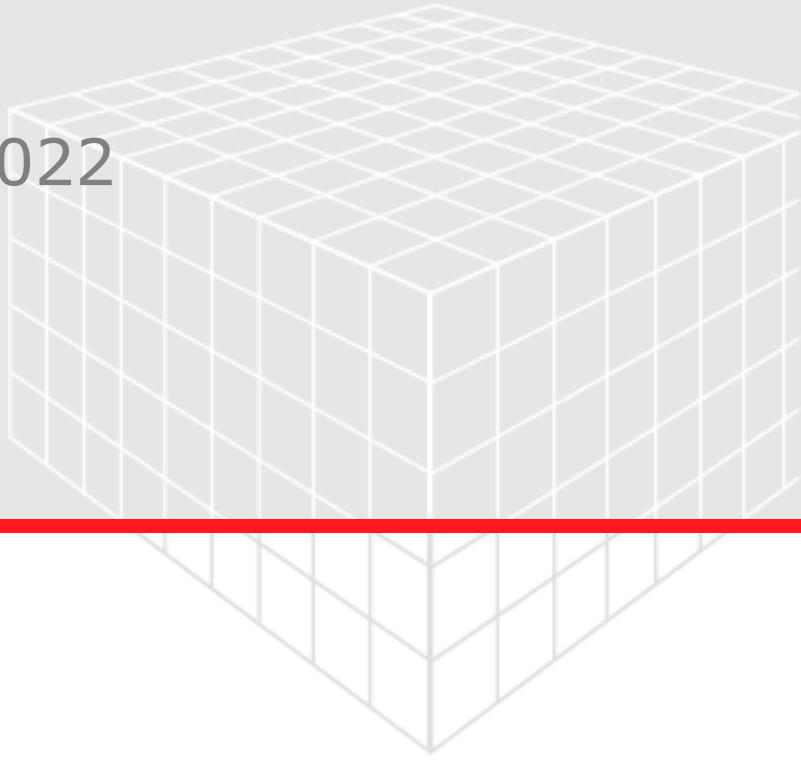

GeoDict

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IMPORTGEO SUBMODULES 1
IMPORTGEO-BASE 2
FILE FORMATS FOR IMPORTGEO-BASE 4
GEODICT BINARY (*.GDT) AND ANALYTIC DATA (*GAD) 4
Import as Analytical Structure 5
DOMAIN PARAMETERS 5
CONTROL OBJECT OVERLAP 7
DELETE INVISIBLE GAD 8
ROTATE GAD 8
Import as Voxel Structure 8
GEODICT ASCII (*.LES) AND GEODICT 32BIT (*.G32) 10

IMPORTGEO SUBMODULES

The three ImportGeo submodules can import most 2D and 3D image file formats into GeoDict.

- ImportGeo-Base loads structure files with a GeoDict file format.
- ImportGeo-Vol is used to import most image file formats for 3D visualization, 3D image processing and segmentation. On imported gray value images, ImportGeo-Vol can perform 3D processing with a variety of filtering techniques. Subsequent segmentation converts gray values to material index values typically stored in the GeoDict Binary file format. For more information, check the ImportGeo-Vol handbook of this User Guide.
- ImportGeo-CAD imports surface triangulation files that describe only the surface geometry of a three-dimensional object. During import, these files can be converted to 3D material models. For more information, check the ImportGeo-CAD handbook of this User Guide.

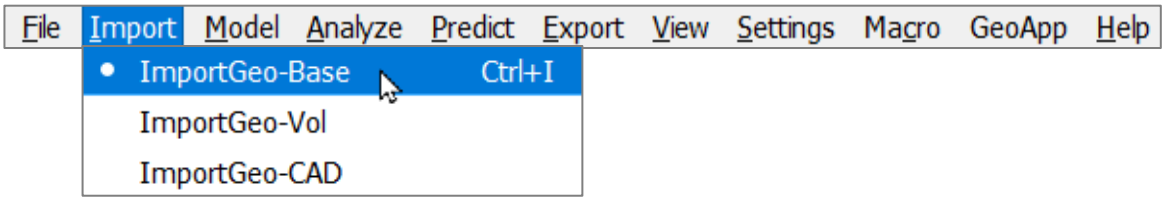
The three ImportGeo submodules import the following file formats:

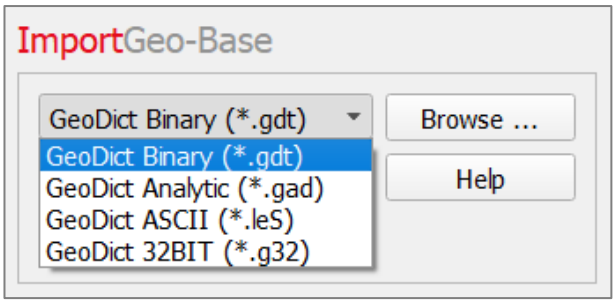
ImportGeo **submodule**	**File formats**			
ImportGeo-**Base**	GeoDict Binary (*.gdt)	GeoDict Analytic (*.gad)	GeoDict ASCII (*.leS)	GeoDict 32BIT (*.g32)
ImportGeo-**Vol**	1, 2 or 4 Byte Integer (*.raw)	4 Byte Float (*.vol)	GeoDict Raw File (*.grw)	GeoDict Binary (*.gdt)
	GeoDict ASCII (*.leS)	GeoDict 32BIT (*.g32)	Rek File (*.rek)	Zeiss 3D Image (*.txm)
	Avizo Binary File (*.am)	WiseTex Vox File (*.vox)	IASS File (*.iass)	TIF Image File (*.tif) (*.tiff)
	BMP Image File (*.bmp)	CUR Image File (*.cur)	GIF Image File (*.gif)	ICO Image File (*.ico)
	JPEG Image File (*.jpeg)	JPG Image File (*.jpg)	PBM Image File (*.pbm)	PGM Image File (*.pgm)
	PNG Image File (*.png)	PPM Image File (*.ppm)	SVG Image File (*.svg)	SVGZ Image File (*.svgz)
	XBM Image File (*.xbm)	XPM Image File (*.xpm)		
ImportGeo-**CAD**	STL File (*.stl)	OBJ File (*.obj)		

For complete information on GeoDict file formats and file formats supported by GeoDict, see **File Management** in the Base Reference handbook of the GeoDict User Guide.

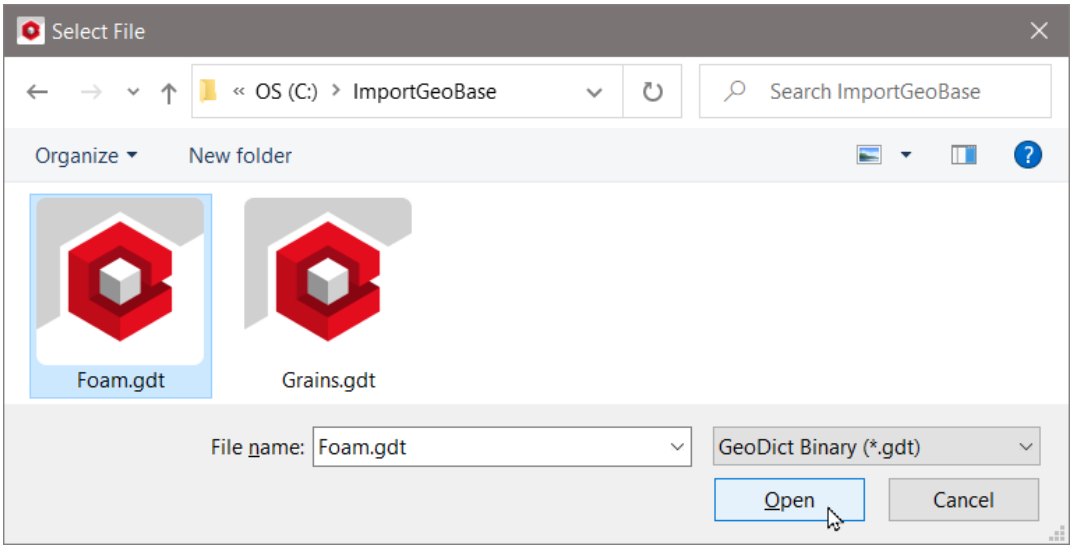
IMPORTGEO-BASE

To import structure data in GeoDict formats, select **Import → ImportGeo-Base** in the menu bar. The **ImportGeo-Base** section opens at the left of the GeoDict GUI.





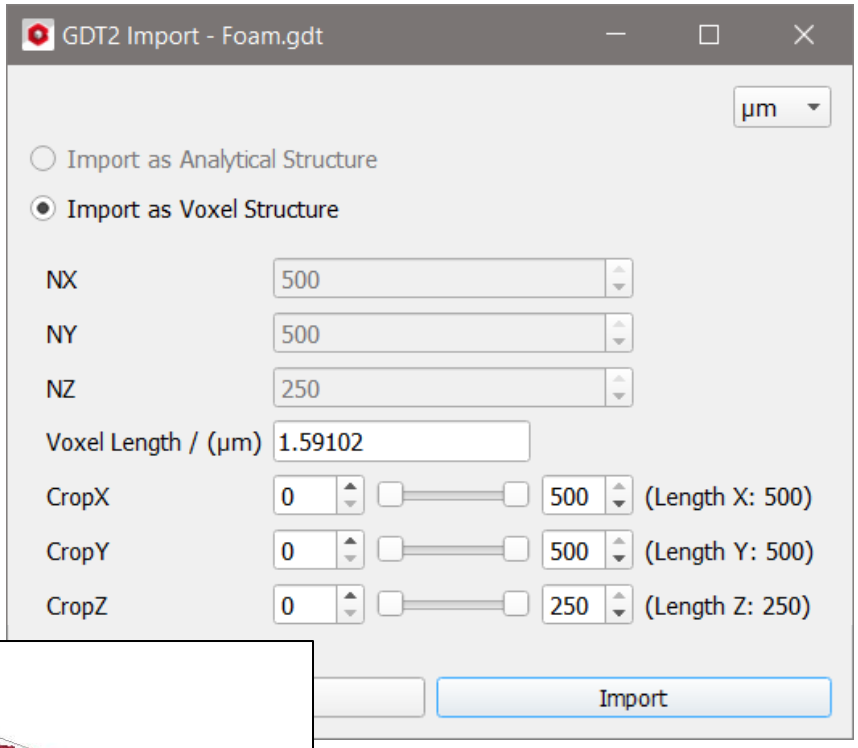
The data format to be imported is selected from the pull-down menu in the **ImportGeo-Base** section. After selecting the format (here *.gdt), clicking **Browse** opens a **Select File** dialog box to locate a file of that format in the chosen project folder. Select the file name and click **Open**.

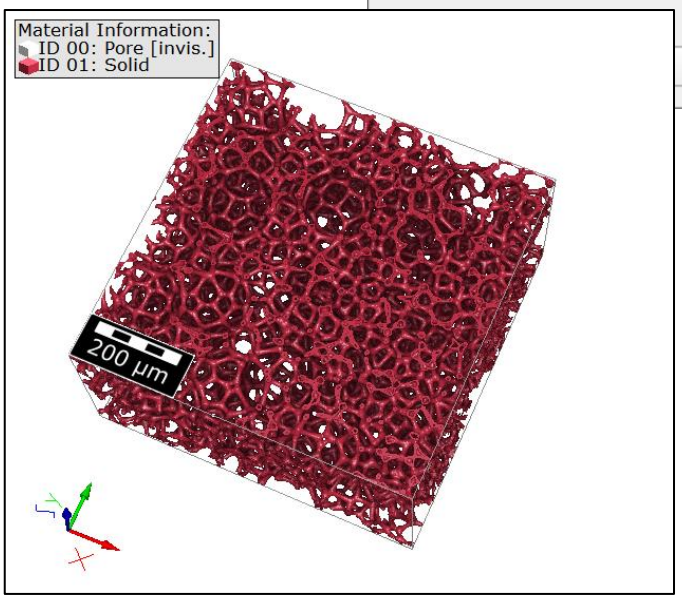


The size of the microstructure contained in the file is automatically entered.

Since GeoDict 2019, the *.gdt format can also contain analytical information. Thus, there are two import options for this file format: **Import as Voxel Structure** or **Import as Analytical Structure**. The second option is enabled only if the *.gdt file contains analytical information. Geometry modeling with GeoDict is based on geometric objects like spheres, ellipsoids, and fibers. In GeoDict, these analytic objects are called gad-objects, where gad stands for GeoDict analytic data. Learn more about the GeoDict analytical data in the GAD Format handbook of the GeoDict User Guide.

Click **Import** to import the microstructure into GeoDict. Now, the structure is shown in the Visualization area.





File formats for ImportGeo-Base

With ImportGeo-Base it is possible to directly load the main GeoDict formats: *.gdt, *.gad, *.leS and *g32 formats.

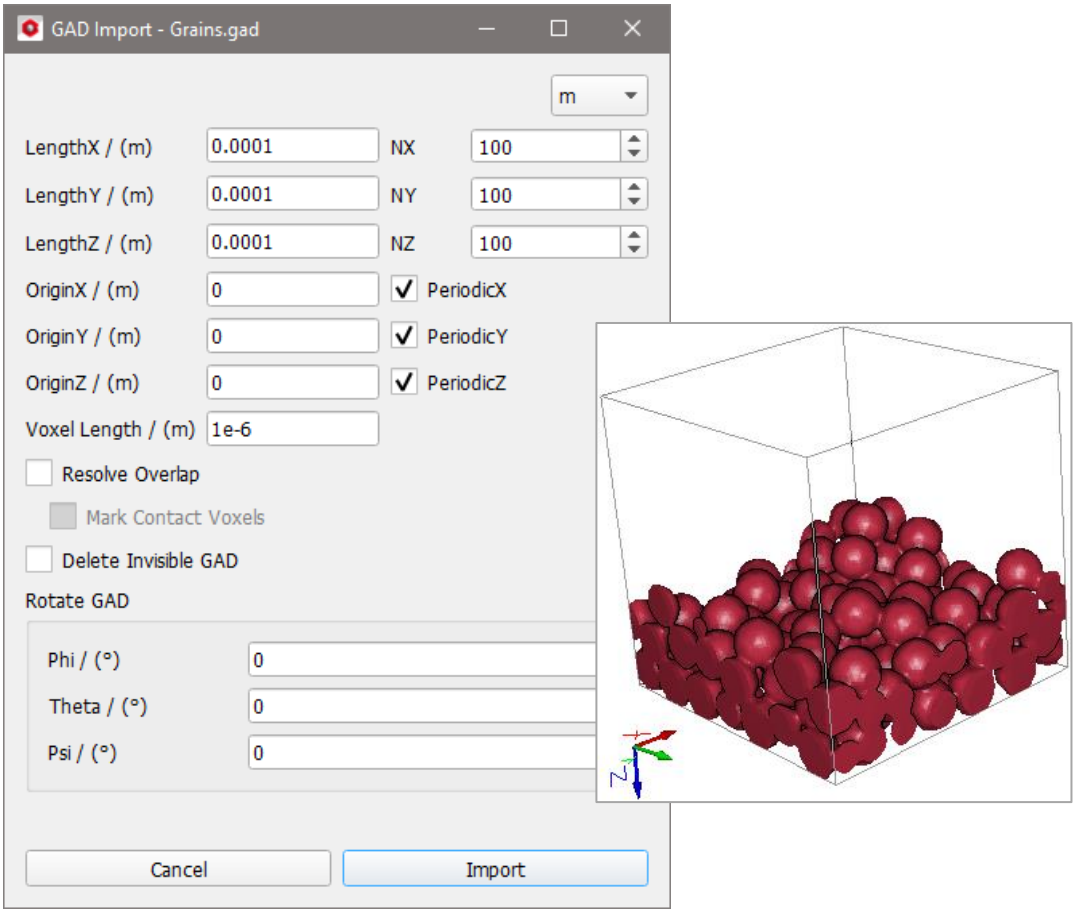
Loading files via ImportGeo-Base instead of simply opening them by selecting **File → Open Structure (*.gdt, *.gad) ...** or **File → Load Volume Field...** in the menu bar allows changing the voxel size and cropping the structure. Additionally, structures with GAD data can be rotated during import.

GeoDict Binary (*.gdt) and Analytic Data (*gad)

Select **GeoDict Binary (*.gdt)** or **GeoDict Analytic Data (*.gad)** from the pull-down menu and click **Browse** to choose and open the file of interest.

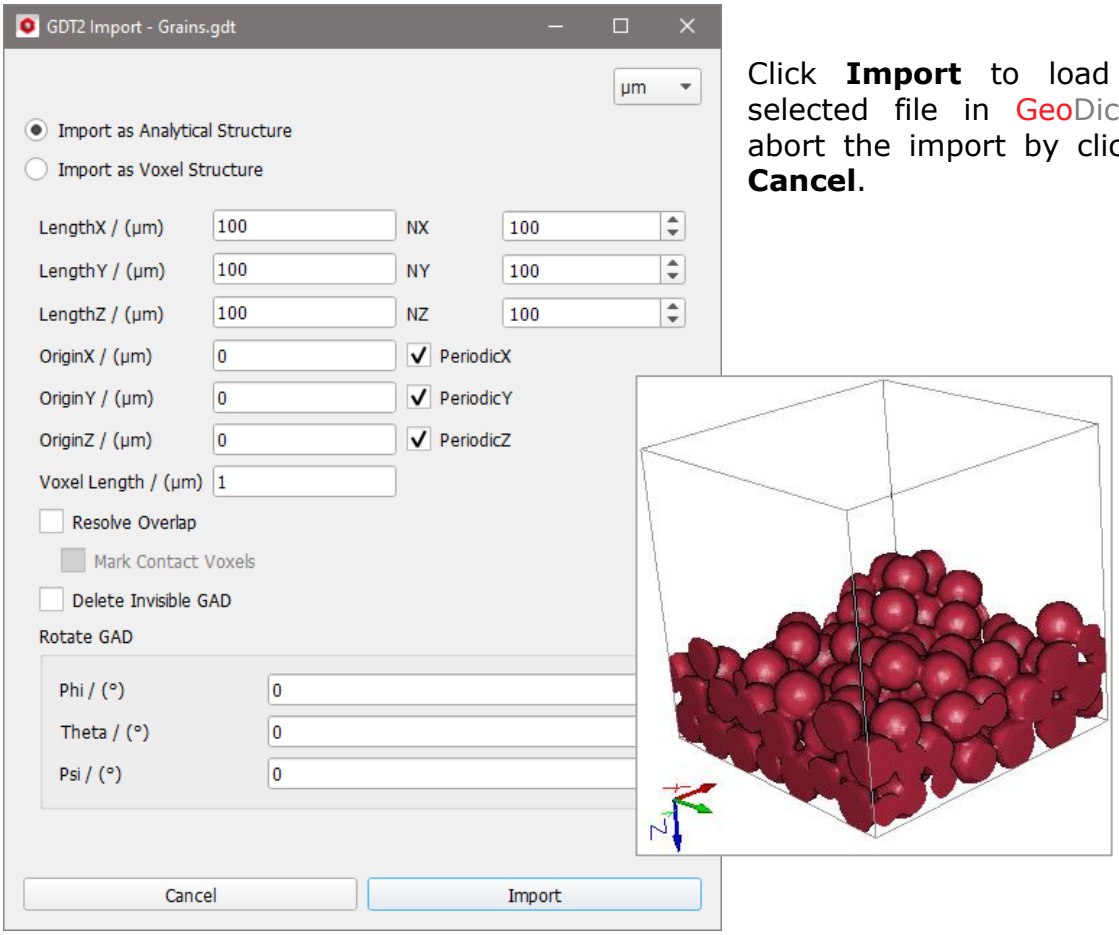
The available units (**m**, **mm**, **µm**, **nm** and **Inch**) are selectable from the pull-down menu at the top right of the **Import** dialog.

For both types of files, the **Voxel Length** and the dimensional values of **NX**, **NY**, **NZ** are automatically filled in.



For **GeoDict Binary (*.gdt)** containing analytical information, the options to **Import as Voxel Structure** or **Import as Analytical Structure** are shown.

The options for **Import as Analytical Structure** are the same as for **GeoDict Analytic Data (*.gad)**.



Click **Import** to load the selected file in GeoDict or abort the import by clicking **Cancel**.

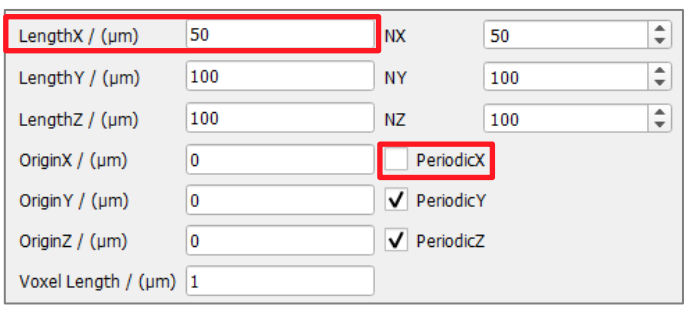
Import as Analytical Structure

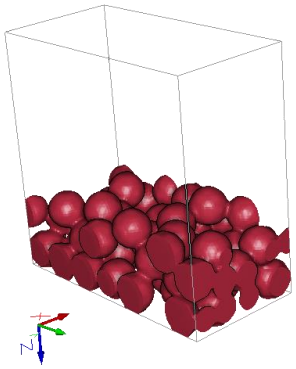
Domain Parameters

For a file which contains analytical information of the microstructure, the size can be adjusted by changing the voxel counts **NX**, **NY**, **NZ**, changing the **Voxel Length**, or changing the **Length**.

Changing the values for **LengthX, LengthY and LengthZ** crops or embeds the structure. This also changes the values for **NX**, **NY** and **NZ**. If a smaller value is entered for length, it is recommended to disable the periodicity in the corresponding direction to prevent overlap.

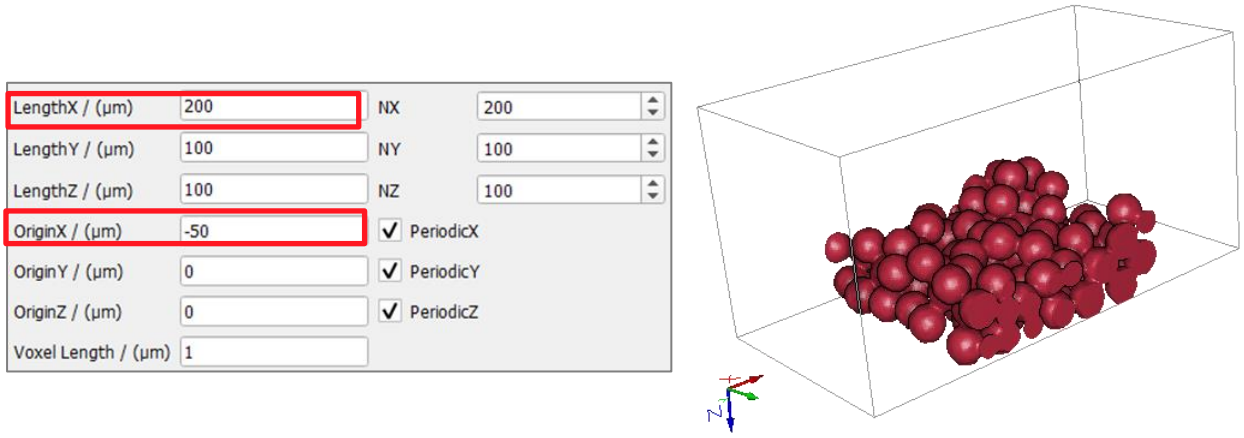
In the example below, the **LengthX** was changed from 100 to 50 and **PeriodicX** was unchecked. Thus, the structure is cropped in X-direction.





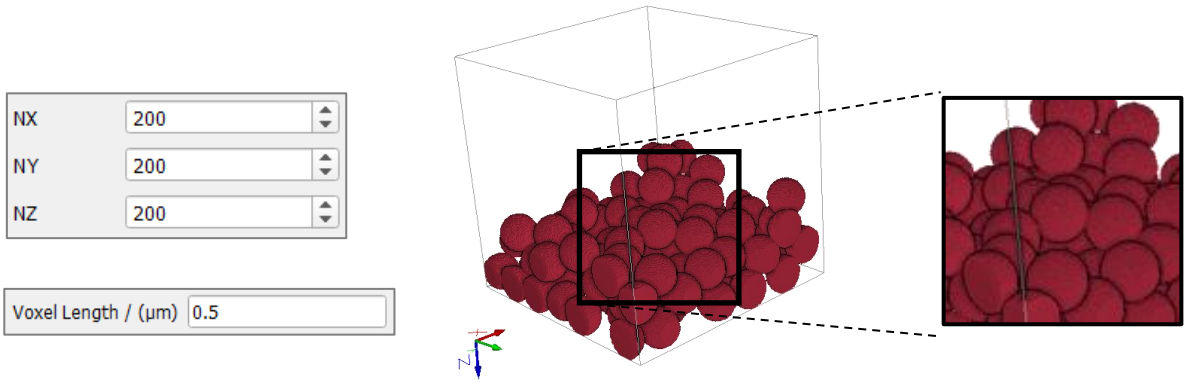
The parameters **OriginX**, **OriginY** and **OriginZ** control the position of the structure in the domain. This is very useful if the values for **Length** are changed.

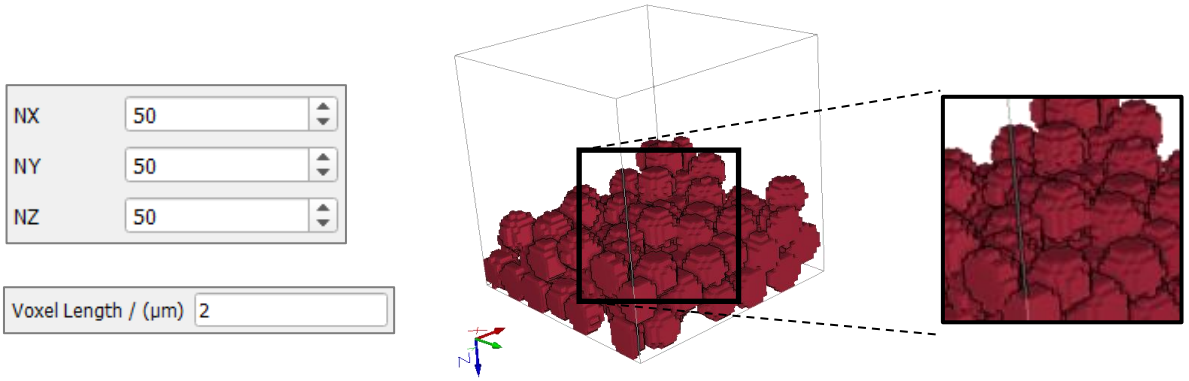
In the following example, the **LengthX** was set from 100 µm to 200 µm and the **OriginX** was set to -50µm. For this structure, this leads to a position in the center of the bigger domain. Observe, that the grains are no longer cut in X-direction, as the analytical data for the complete grains is stored in the structure file.



Changing the **Voxel Length** also changes the values for **NX**, **NY** and **NZ** and controls the size of the loaded structure. The values for **NX**, **NY** and **NZ** can also be changed manually, which changes the **Voxel Length** accordingly.

Observe how the resolution changes according to the selected size.





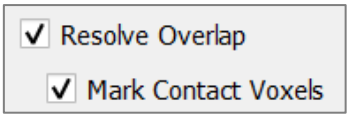
Checking the **PeriodicX**, **PeriodicY**, and **PeriodicZ** boxes allows the import of structures which are periodic in one or several directions. Periodicity has the effect that objects ending on one side of the volume reappear on the opposite side.

Control Object Overlap

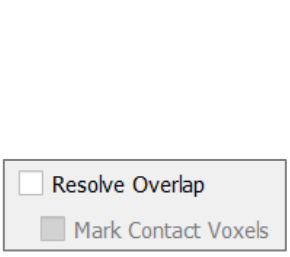
In GeoDict structures, analytic objects might overlap. The overlap locations can have other properties than the original materials. Thus, by default the overlap is assigned to a new material ID.

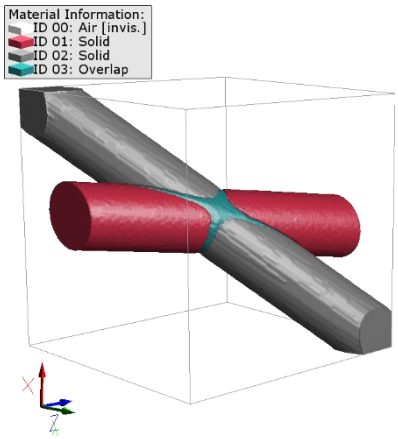
If **Resolve Overlap** is checked, the overlap is not assigned to a new material ID. Instead, the watershed algorithm is used to decide which of the overlap voxels belongs to which object. Thus, each overlap voxel is assigned to one specific object. This option needs more memory and a longer run-time.

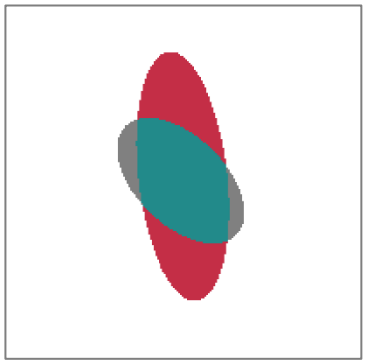
To mark the contact voxels between the objects with a separate material ID, select **Mark Contact Voxels**.

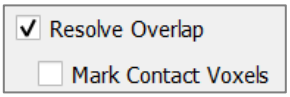


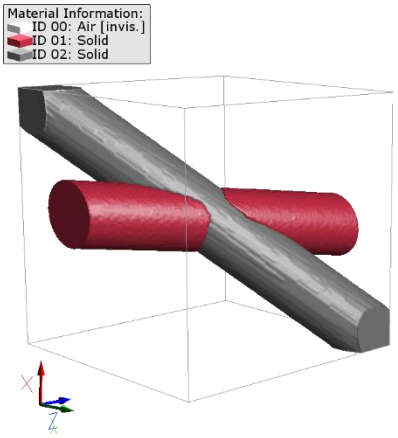
In the following, observe the resulting Material IDs for the overlap for not resolved, resolved, and resolved overlap with marked contact voxels, while all other settings are kept the same.

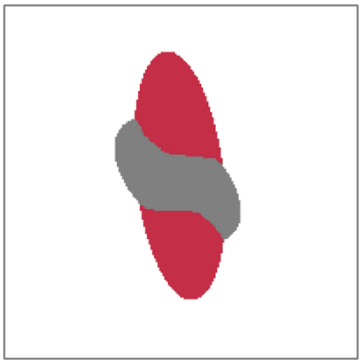


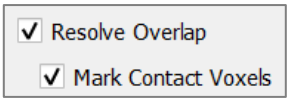


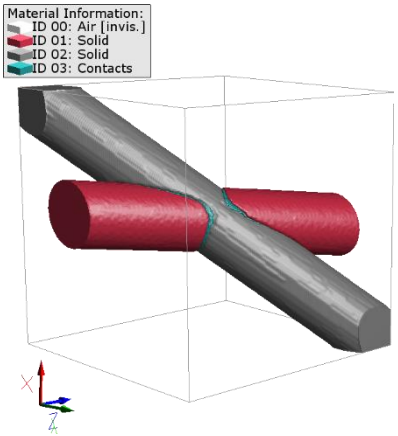


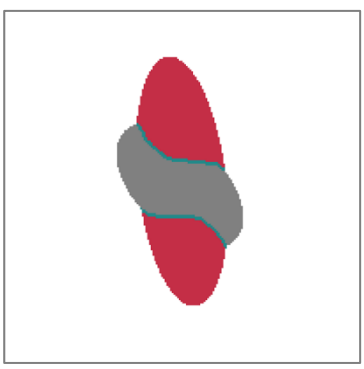










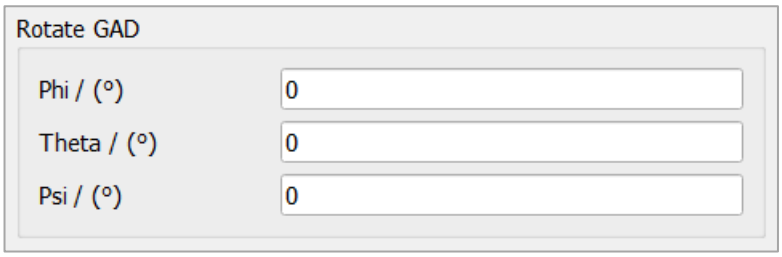


Delete Invisible GAD

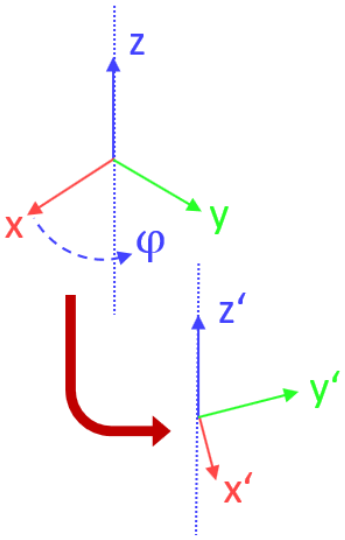
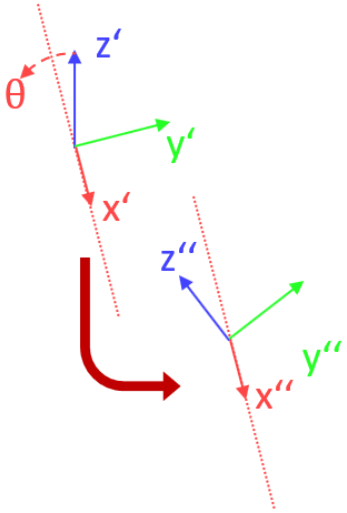
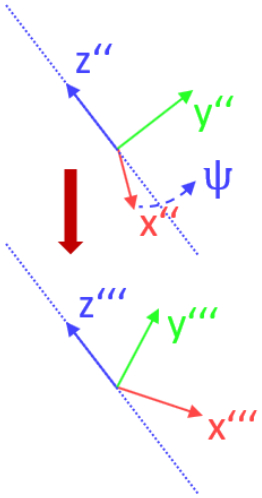
Check **Delete Invisible GAD** to not import GAD objects which lie completely outside of the domain.

Rotate GAD

The imported GAD file can also be rotated by defining the Euler Angles **Phi**, **Theta**, and **Psi** in the **Rotate GAD** panel for the different axes.



The Euler rotation angles are applied to the objects during the generation following the order Phi → Theta → Psi

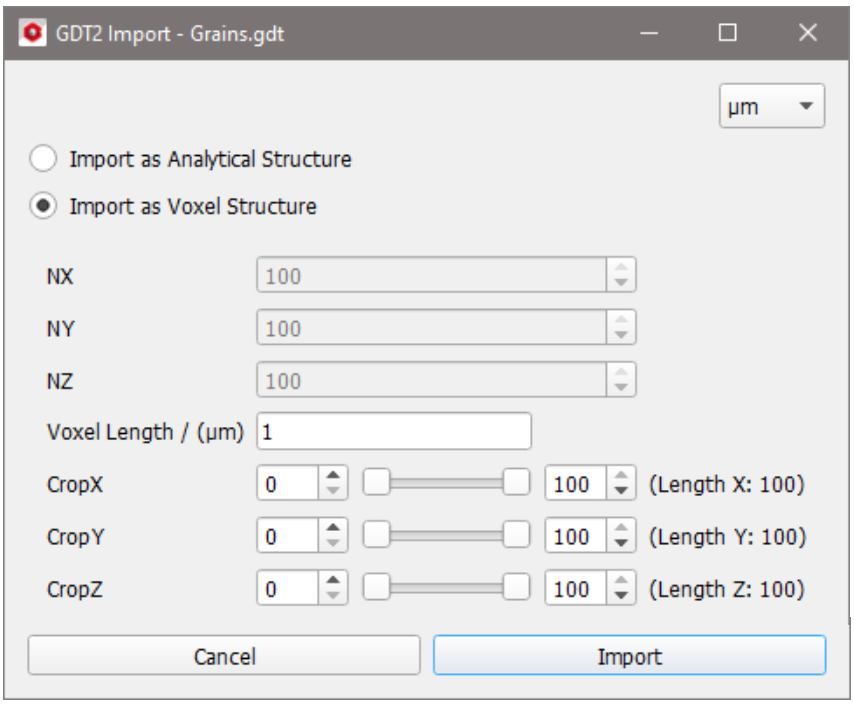
Z-axis fixed	new X-axis fixed	new Z-axis fixed
Phi applies rotation around existing Z-axis	**Theta** applies rotation around the new X-axis	**Psi** applies rotation around the new Z-axis
		

Import as Voxel Structure

If **Import as Voxel Structure** is checked, the dimensional values of **NX**, **NY**, **NZ** cannot be changed.

The **Voxel Length** can be changed and has no impact on the number of voxels.

A sub-region to load can be set by adjusting the sliders for **CropX**, **CropY** and **CropZ** or entering the exact voxel number in the corresponding boxes. The resulting **Length** is shown on the right in the unit selected from the pull-down menu in the upper right corner of the dialog.

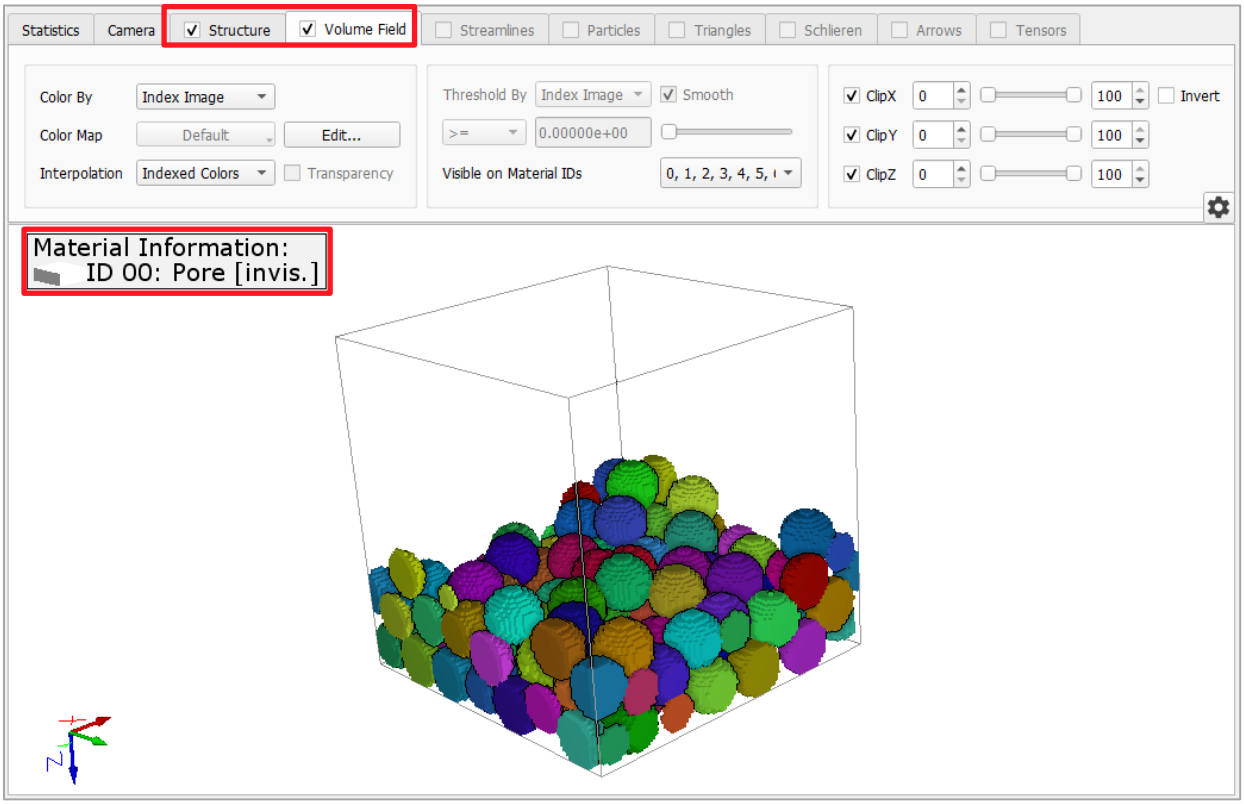

GDT2 Import - Grains.gdt
µm
Import as Analytical Structure
Import as Voxel Structure
NX
100
NY
100
NZ
100
Voxel Length / (µm)
1
CropX
0
100
(Length X: 100)
CropY
0
100
(Length Y: 100)
CropZ
0
100
(Length Z: 100)
Cancel
Import

GeoDict ASCII (*.leS) and GeoDict 32BIT (*.g32)

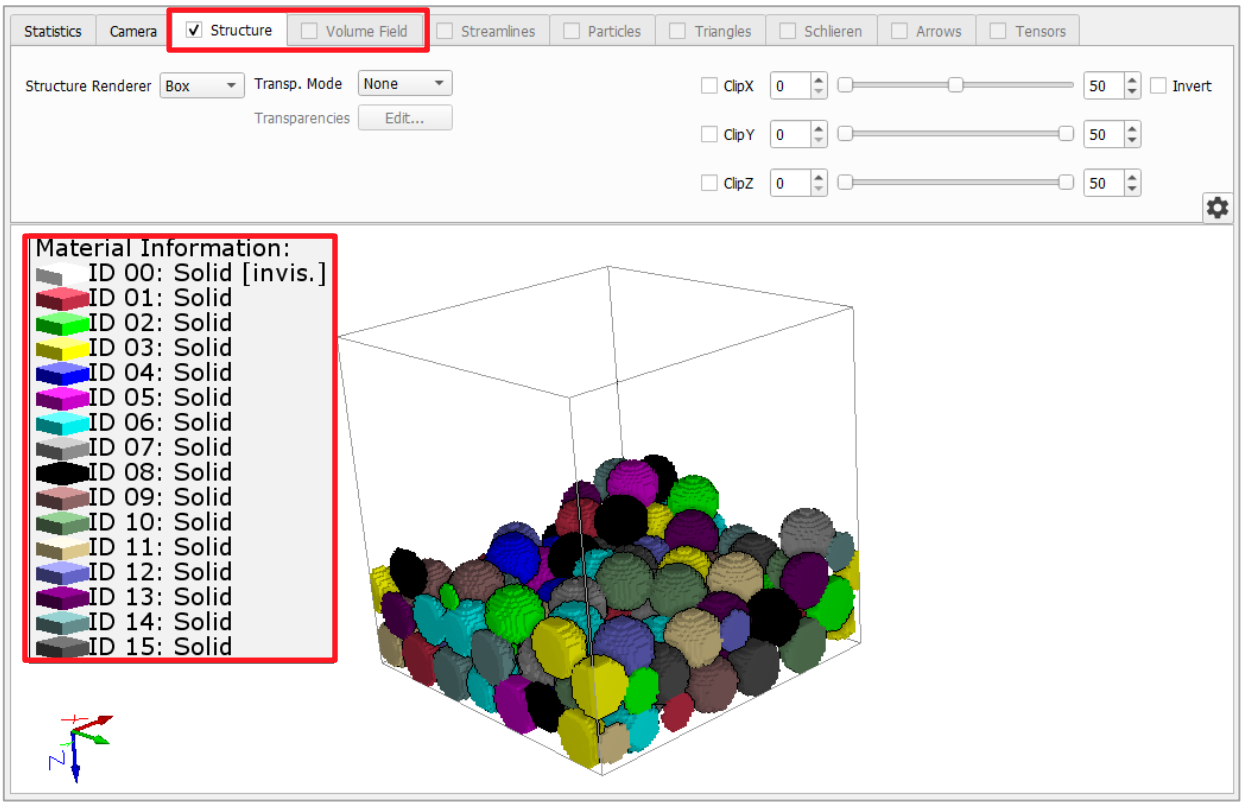
Loading a *.leS or *.g32 file with **File → Load Volume Field** loads it as an index image. Using ImportGeo-Base instead imports the file as a structure in GeoDict, assigning the indices to the 16 material IDs. First, the index 0 is assigned to ID00. Then, the other indices are assigned to the other 15 IDs equally. That means, index 01 gets ID 01, index 02 gets ID 2 and so on till index 15 gets ID 15. Then, index 16 is assigned to ID 01 again.

In the following example a *.g32 file first is loaded with **File → Load Volume Field** and then again using ImportGeo-Base.

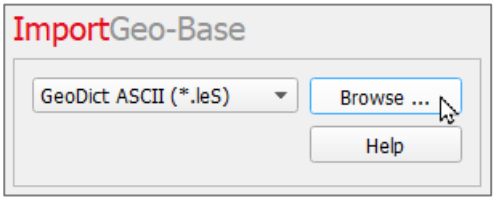
For the volume field each grain has a different index.

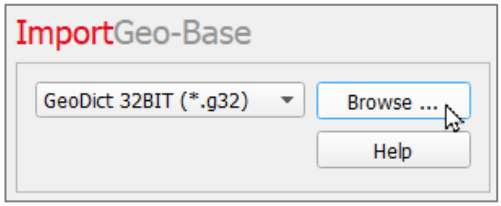


If the same file is loaded with ImportGeo-Base, the objects are assigned to the 16 material IDs. The **Volume Field** tab is not available, as no volume field is loaded.



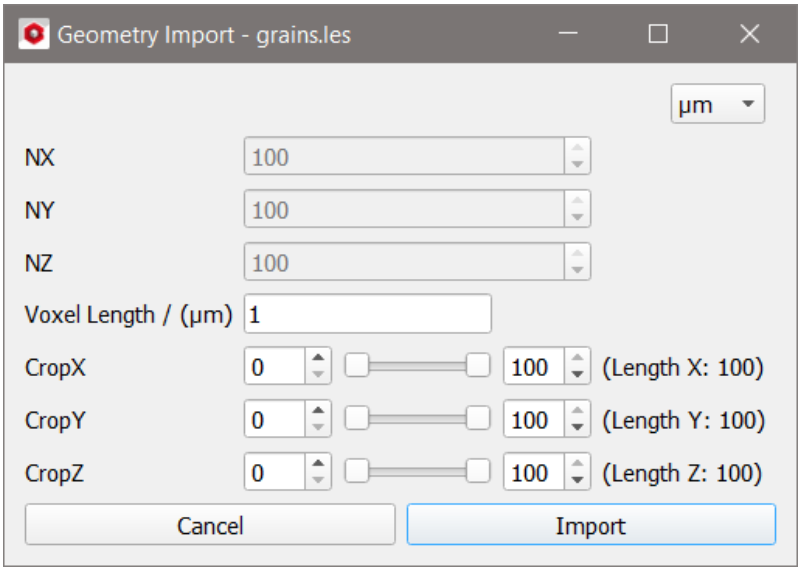
Select **GeoDict ASCII (*.leS)** or **GeoDict 32BIT (*.g32)** from the pull-down menu and click **Browse** to choose and open the file of interest.

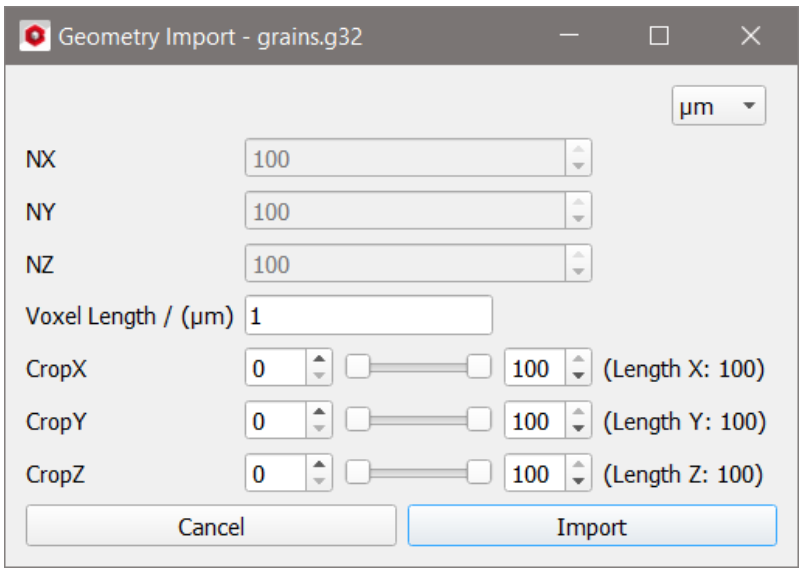




The available units (**m**, **mm**, **µm**, **nm** and **Inch**) are selectable from the pull-down menu at the top right of the **Import** dialog.

The GeoDict ASCII file type *.leS contains structure information in ASCII format. The file type *.g32 contains GeoDict structures with object index information. Both files store the number of voxels in each of directions (**NX**, **NY** and **NZ**) and the **Voxel Length**.

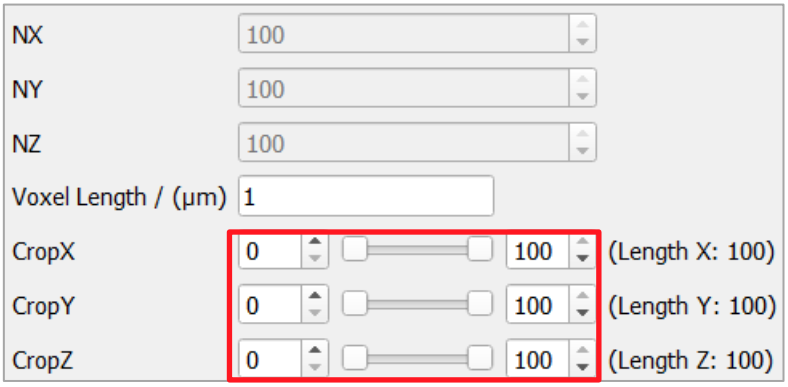


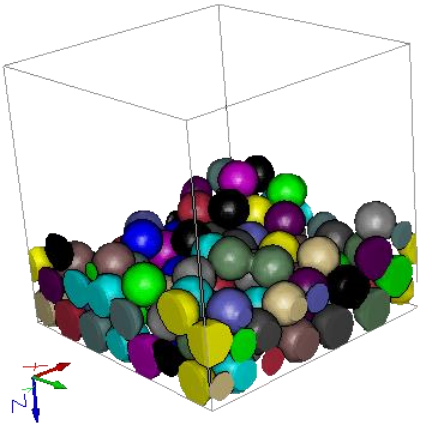


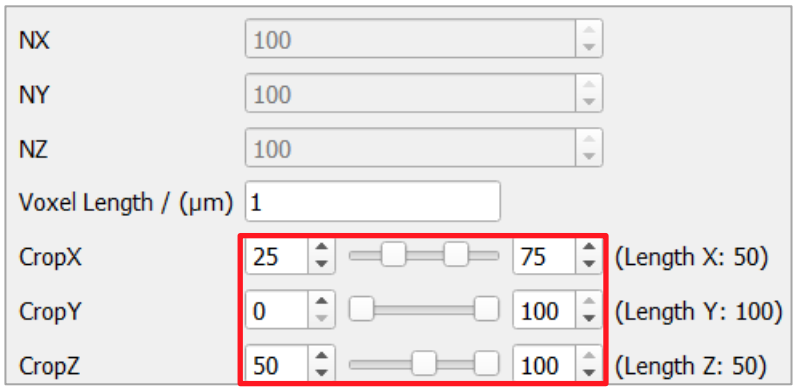
The **Voxel Length** can be changed and has no impact on the number of voxels.

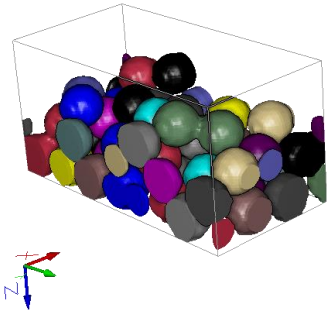
A sub-region to load can be set by adjusting the sliders for **CropX**, **CropY** and **CropZ** or entering the exact voxel number in the corresponding boxes. The corresponding **Length** is given on the right in the unit selected from the pull-down menu in the upper right corner of the dialog.

In the following example a *.g32 file is loaded once without changing the parameters and once cropped in X and Z.









Load the file in GeoDict by clicking **Import** in the **Geometry Import** dialog.

https://doi.org/10.30423/userguide.geodict2022-importgeobase

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