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# Materialise Magics[25]

User manual

Note: Magics Essentials only contains a subset of the features of Magics RP

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# Table of contents

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# Part I: Introduction

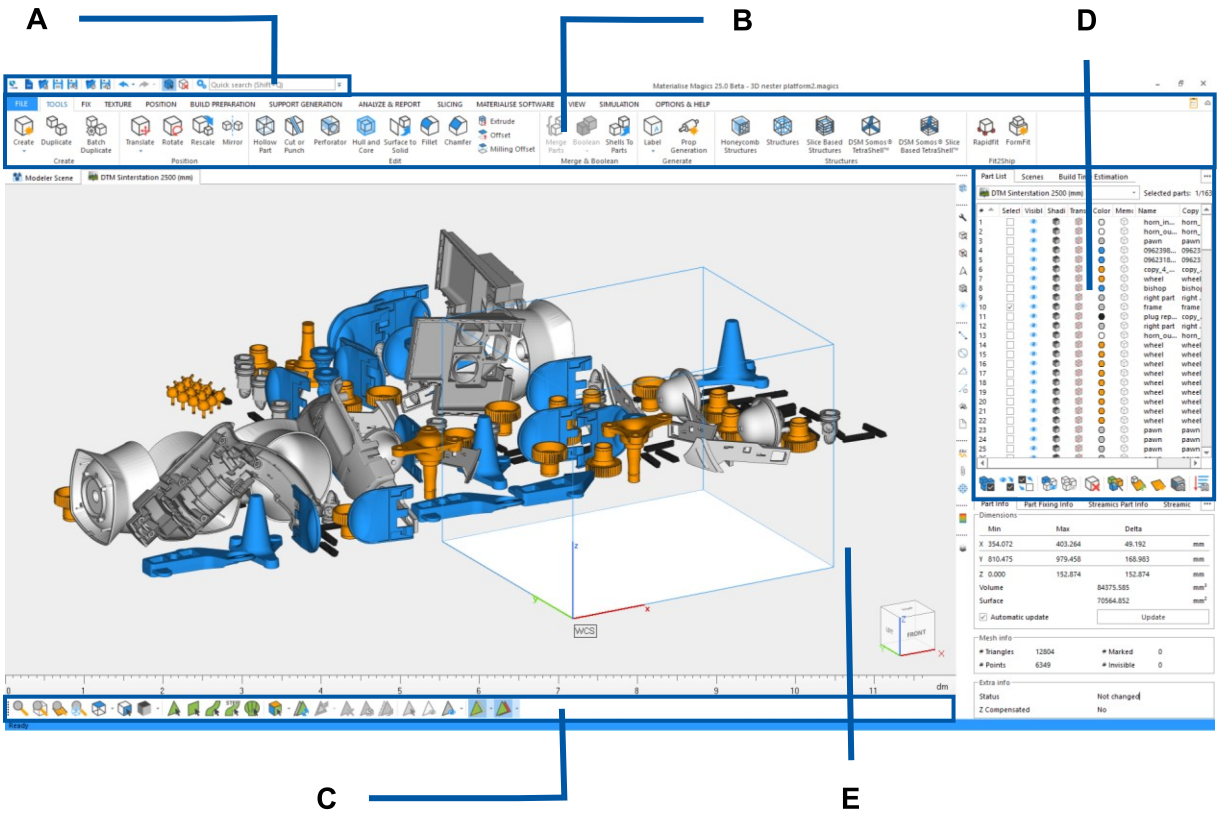
# 1 Chapter 1: Overview Magics

For everyone who works with STL files, Magics is the ideal and complete software solution. Magics sets the standard for ease of use and efficiency when working with faceted data. It offers advanced and highly automated tools for STL manipulation. You can correct an STL file in a matter of minutes with the help of unmatched tools to interact directly on defective triangles. You are involved in Rapid Prototyping? Then Magics is indispensable for you… It's the only software that is tuned entirely to the needs and characteristics of the Rapid Prototyping process. The powerful and efficient 3D tools of Magics RP enable you to deliver high quality prototypes with the shortest lead times, while providing you and your clients with full documentation in the process.

## 1.1 User interface

You create and manipulate your parts and projects using various elements, such as scene, toolpages, toolbars, and windows.

The following image identifies the main elements of the user interface:




— A: Quick access bar
— B: Ribbon pages
— C: Toolbar
— D: Toolpages
— E: Scene

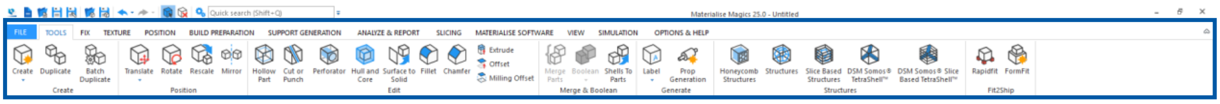
### 1.1.1 Quick Access Toolbar

The Quick Access Toolbar gives you instant access to a number of often-used options, as for example open, copy or save a file, unload a part, undo/redo, settings.

The quick search allows you to find and access any option within Magics without having to search through all the menus.


### 1.1.2 The Ribbon pages

Within the Ribbon pages (red) you can find nearly all the possible options of Magics. All options are sorted and grouped in different ribbons in which you can find all the relevant options. To improve the ease of use in Magics we have also created tabbed toolpages . These toolpages contain the most used functions of the Main Menu and show them as small icons. If you quickly want to Edit, Fix or Mark your part: these tabbed toolpages deliver you the different options in a single click.




#### *1.1.2.1 File Operations – The File ribbon*

Via the File ribbon, you can import and export platform files, load and save MAGICS, MGX and STL files and import files that have a format different from these, for instance IGES, STEP… The file ribbon provides also the access to the machine library, where machine dependent parameters can be defined for existing and new machines. Thanks to the e-mail functionality, you can send machine files, preference files and the loaded parts. The print functionality is foreseen to make a fast print of the parts. Further on, you can create templates and generate reports about loaded projects that may include different snapshots of the files and all kinds of RP related information.

#### *1.1.2.2 Tools – The Tools ribbon*

The tools ribbon groups a number of handy tools to adapt the STL file. You can select parts and translate them manually, but you can also cut, copy and duplicate the parts.

The second set of tools given in the *Tools ribbon* handle on dealing with different groups of triangles (shells) within a certain part. Performing Boolean operations on different parts or duplicating parts are just one of the many options.

The second group of tools really manipulates the design of a part. For instance you can cut a big design in different parts that can be reassembled after manufacturing. It is also possible to detect any thin or weak sections in the design or hollow your design to save energy and powder. Also some additional Modules of Magics with who you can produce structures within your part can also be found (if licensed) in the *Tools ribbon*.

#### *1.1.2.3 Repair STL files – The Fix ribbon*

Another important group of functions can be found in the fix ribbon. The autofix functions guide you through the different fixing steps. It provides you functionalities to detect double surfaces and remove them, filter sharp triangles and small parts, perform a reduction of triangles and even smoothing processes.

#### *1.1.2.4 Apply textures – The Texture ribbon*

In the Texture ribbon, you can find all functions to add or alter a texture. The painting a part, splitting parts by color or color surface options can also be found here.

#### *1.1.2.5 Positioning of STL Files – The Position ribbon*

The position ribbon groups all necessary operations you need to manipulate the position and orientation of the part(s). The latter contains functions to translate, rotate, rescale, mirror, … your files. The user coordinate system can help in the aligning process, as well in positioning and fixing.

#### *1.1.2.6 Multiplatforms - The Build Preparation ribbon*

In Magics you have the opportunity to work with different platforms in one Magics session. All commands concerning platforms like create a new scene, edit scene properties, export scene… are gathered in the ribbon: Scene, Build preparation and Export.

#### *1.1.2.7 Support Generation ribbon*

In the Support generation ribbon, you can find all options to add supports to your design: generate, view, alter and unload a support or all supports.

#### 1.1.2.8 Analyze & Report ribbon

In the Analyze & Report ribbon, you can find all options to analyze your STL file and generate reports. With the Analyze functionalities, you can analyze your design on possible build risks, like e.g. out of bounds, thin walls or trapped volumes. The Estimate functionalities provide you a good view on the estimated costs and build duration, based on your machines. The measure functionalities provide you with tools to analyze and measure different parts in details.

#### 1.1.2.9 Slicing ribbon

The Slicing ribbon groups some options to slice your design: a preview, slice all parts, or only slice the selected parts.

#### 1.1.2.10 Materialise Software ribbon

In the Materialise Software ribbon, you have quick access to functionalities of other Materialise products, such as Streamics, Robot and e-Stage.

#### 1.1.2.11 Visualization and Manipulation of STL Files – The View ribbon

From this ribbon on, you can choose to display the coordinate system and/or an orientation indicator. The part can be displayed in different ways due the different shading modes and predefined orientations. You have also the possibility to rotate and pan your view with the mouse buttons. Different zoom options are foreseen in this menu. You have the option to show the name of the part as a tag, the platform of the selected machine, the build envelope and the part dimensions. You can make a screenshot of the working window, and export the current view as a JPEG, Bitmap, GIF…

#### 1.1.2.12 Customize your Magics RP – The Options & Help ribbon

In the Options & Help ribbon you can customize ‘your Magics RP’. In Settings you can choose a lot of technical parameters concerning the visualization, modules and file input and output. You are also able to define your mouse functionality, toolbars and shortcuts in the Customize Wizard.

You can find the registration window, licenses information and your dealer ID in this ribbon.

The help options gives you access to Magics Help and the Tutorial, the Magics User Community (an internet page where you always can find actual information about Magics, tips & tricks…) and a link to the STLfix site. STLfix is a service of Materialise that helps you to convert, fix and edit files.

### 1.1.3 Toolbars

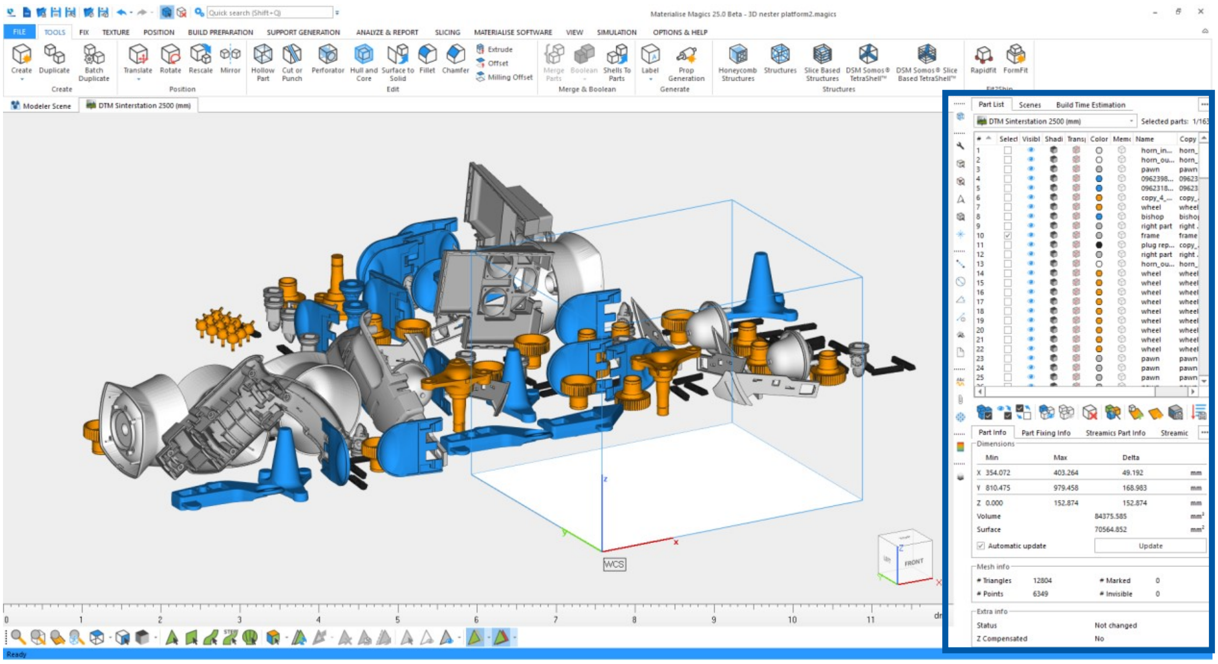
There is one default toolbar available: the general toolbar. This toolbar includes view and marking tools.

The view tools allow you to manipulate the view (e.g. zoom options or standard views) and the visualization of the parts on the scene (e.g shading modes).

The marking functions allow you to mark a STL file or parts thereof. The marking tool is used in combination with other functions like fixing or editing tools. Due the different marking tools you can mark very fast and accurate, you can choose to mark triangles, planes, surfaces and shells, but you can also mark several triangles by drawing a window, a polyline or polygon.

A user may create custom toolbars.

### 1.1.4 Tool Pages



#### *1.1.4.1 General Pages*

These pages give you an overview on the parts present on the scene, on the scenes created and on the build time estimation library, and they allow you to manage your parts or scenes. The Part List page provides you a list of all parts on the active scene; in this list you can also hide parts, change the part name (double click on Part name) or show any additional information. In the Scenes page, all loaded scenes are displayed within a tree view, together with all parts loaded on that machine.

— See General Pages, page 405

### *1.1.4.2 Part Pages*

The part pages show you all the needed information on the selected part on the scene; the Part Info page contains general information about part dimensions, volume, mesh information, etc…; the Part Fixing Info page can be used to analyze possible errors of the selected part and get suggestions on how to fix it.

— See Part Pages, page 412

### *1.1.4.3 Fixing Pages*

You can use the fixing pages to manually fix the different errors of an STL file: near bad edges, holes, overlapping and intersecting triangles, shells, etc…

To fix a corrupted STL file, the trial and error method is used in many cases. Sometimes, the fixing can damage the part, for example when stitching is done with a too large tolerance. That is why it is advised to save regularly the result of a set of fixing operations. This way, the user does not need to start all over when severe damage was done to the part he was fixing. In case you only want to go back on or two steps of fixing, the undo-function can be used.

— See Fixing Pages, page 418

### *1.1.4.4 Measurement Pages*

Magics offers extended measurement functions. It is possible to measure distances or angles between two features like points, lines, circle centers, middle lines of a cylinder, sphere centers, etc… You also can retrieve coordinate information of a feature and create a report based on a template.

— See Measurements pages, page 434

### *1.1.4.5 Annotation Pages*

In the Annotations and Attachments pages you can create scenes wherein you can draw, add comments and load attachments. This can be very helpful in the communication between customer, sales person and production.

The Textures page allows you to add textures on a part. You can load any image format, choose dimensions, direction and position and print the design on the selected triangles of a part.

— See Annotation Pages, page 445

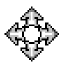
### 1.1.4.6 *Slices Page*

This page offers you the tools to visualize the slices preview of a part loaded on a scene or to analyze a slice file loaded in Magics. Scroll through the slices and visualize the different vector types.

— See Slices page, page 450

## 1.1.5 Scene

The ***Rotate*** function allows rotation of your part around all three axes of your screen. Click the Rotate button and use your left mouse button (press it in the workspace) to rotate your part.

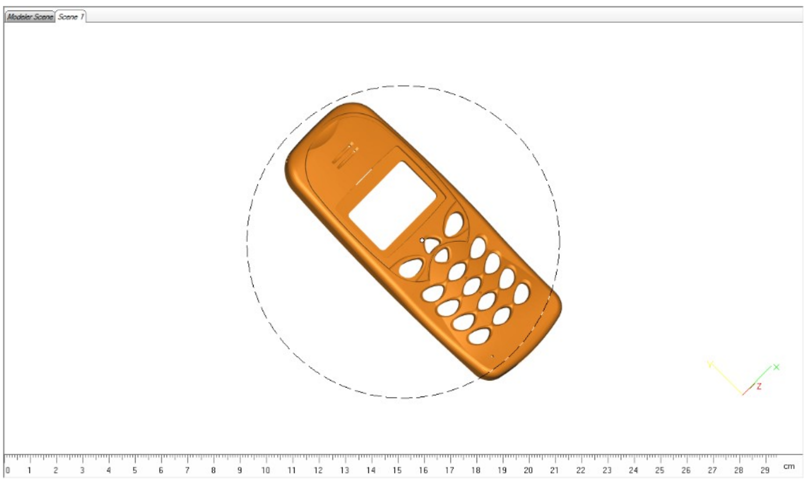


**Quadruple arrow**

The movement of the cursor is translated in a rotation around the three axes in the screen (3D movement). Holding Alt key will allow rotating the view respectively along the vertical or horizontal direction.

**Circular arrow**

The movement of the cursor is translated in a rotation around the axis that is perpendicular to the screen (2D movement).



A circle in the center of your workspace is visualized to show which behavior to expect. When the cursor is inside the circle, it will have a quadruple arrow shape (3D movement). When it is outside the circle, it will have a circular arrow shape (2D movement).

The ***mouse*** also has a rotate option:

You can also access this function via your right mouse button shortcut (without clicking on the Rotate button). Press your RM and keep it down while moving your mouse, the part will rotate in accordance with your mouse movements.

## 1.2 Modules

### 1.2.1 Magics RP

Magics gives you full control over your STL files. Among the offered functions you find:

- Visualization, measuring and manipulation of STL files
- Fixing STL files, uniting shells, trimming surfaces, double triangle detector
- Cutting STL files, punching holes, extruding surfaces, hollowing, applying offset
- Boolean operations, triangle reduction, smoothing, labelling
- Analysis tools
- Documenting files, texturing
- Coloring STL files
- …

### 1.2.2 C-Tools and Slice Module

The Slice module writes out files for 3D systems, EOS, Stratasys and Sanders. Slices are automatically repaired and before the slicing is done, the slice preview allows you to inspect the slices. The C-Tools module writes out contours and hatching for 3D Systems SL 250 machines in the SLI format.

### 1.2.3 Structures Module

The Structures Module enables you to swiftly make complex structures within a certain part. These structures allow you to reduce the consumption of material and weight of the part, without losing strength. Also many technical applications, like for instance generating turbulent gas flow, are made possible without spending more time in CAD.

### 1.2.4 Support Generation (SG) Module

Support generation is crucial to correctly build your rapid prototypes made with Stereolithography or metal sintering. Support structures are needed to prevent distortion, to keep everything in place and to easy remove the part from the platform. Magics Support Generation module is a proven solution that allows quick, easy and automated creation and editing of support structures. This software effectively narrows the gap between part design and part production as it transforms the design directly to ready-to-produce data. Reliability, part integrity and ease of removal of support structures – key issues in Rapid Prototyping – are maximized by Magics Support Generation.

### 1.2.5 Metal Support Generation (SG+) Module

Because generating support for metal parts is not comparable with any plastic technology, the SG+ Module is created as an expansion on the SG Module. Due to the good heat conductivity of metal, great temperature differences can occur within the part. This gives thermal stress that can greatly deform the part. The SG+ module gives the user an extended toolbox to cope with these problems. For instance the included volume and cone supports are designed to conduct the heat away from the part and strongly anchor the part to the platform to minimize the deformation.

### 1.2.6 Tree Support Module

The Magics Tree Support module helps to generate a tree support. A tree support allows you to build a support with a minimal use of material, also providing you with an easy removal of the support.

### 1.2.7 Sintermodule

Magics Sintermodule consists of two functionalities. The 3D nester assures an optimal load for your plastic sintering machine and this very easily and quickly. Considering the parts' geometry, the software automatically nests your parts, maximizing the number of parts in the build envelope and/or minimizing the build time. This solution saves hours of preparation time and greatly reduces the powder consumption. At the same time, the software ensures that none of the parts collides with another part which reduces the risk of human errors. The second functionality is the creation of Sinterboxes. These perforated boxes can protect small and fragile parts from getting lost in the powder or protect them from breakage.

### 1.2.8 Fit 2 Ship

Quickly design cost-efficient fixtures to secure large parts with complex shapes! Firmly positioned, these parts can then easily be checked, measured, machined, transported, glued or assembled. Speed and quality are two of the biggest concerns in Rapid Prototyping. You can achieve both by creating and using Magics RapidFit-based fixture elements. It's the ideal solution for the design and set-up of a support system for your parts.

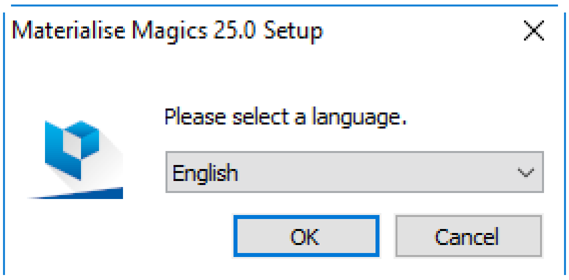
# 2 Chapter 2: Installation

We recommend that you close all other applications before installing Magics. You must have administrative privileges to install the software. Place the Magics DVD into your DVD-drive. The autorun starts automatically. If the autorun does not start automatically, browse to your DVD-drive and choose autoplay or double-click on 'MagicsSetup.exe' in the Magics folder.

During the installation the following dialogs will be shown.

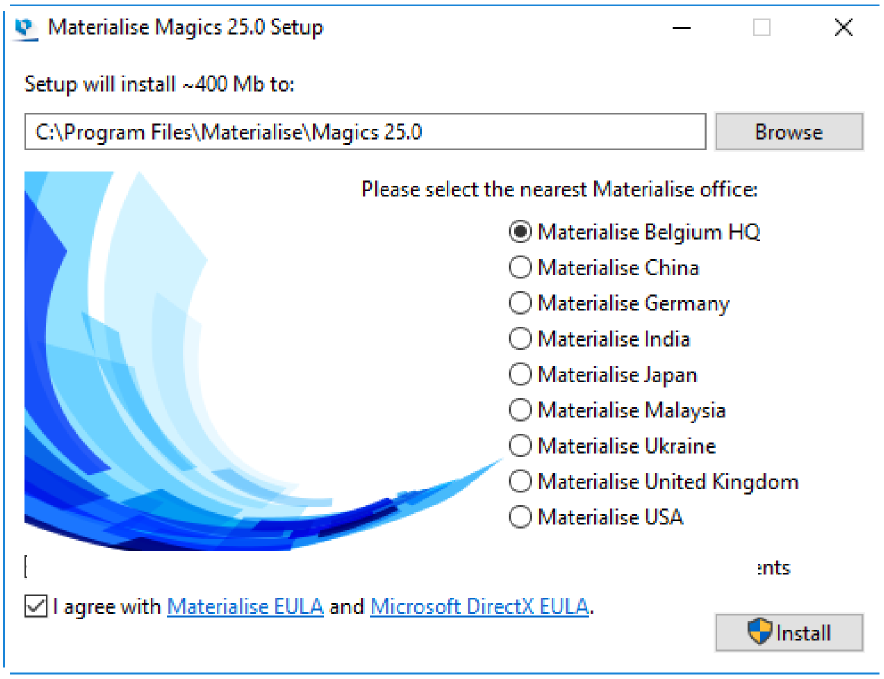
## 2.1 Step 1

Wait until the Windows installer is ready to start the installation.




Select your language and click ***Next*** to proceed.

## 2.2 Step 2

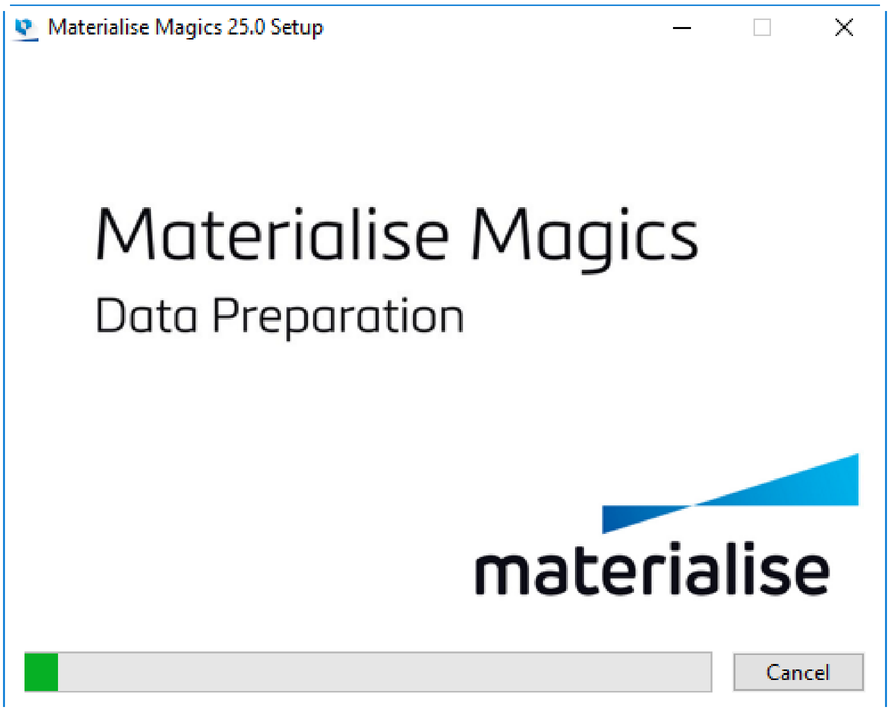



Select the folder where you want to install Magics RP. Via the browse button you can specify a new directory, however we advise to use the default directory.

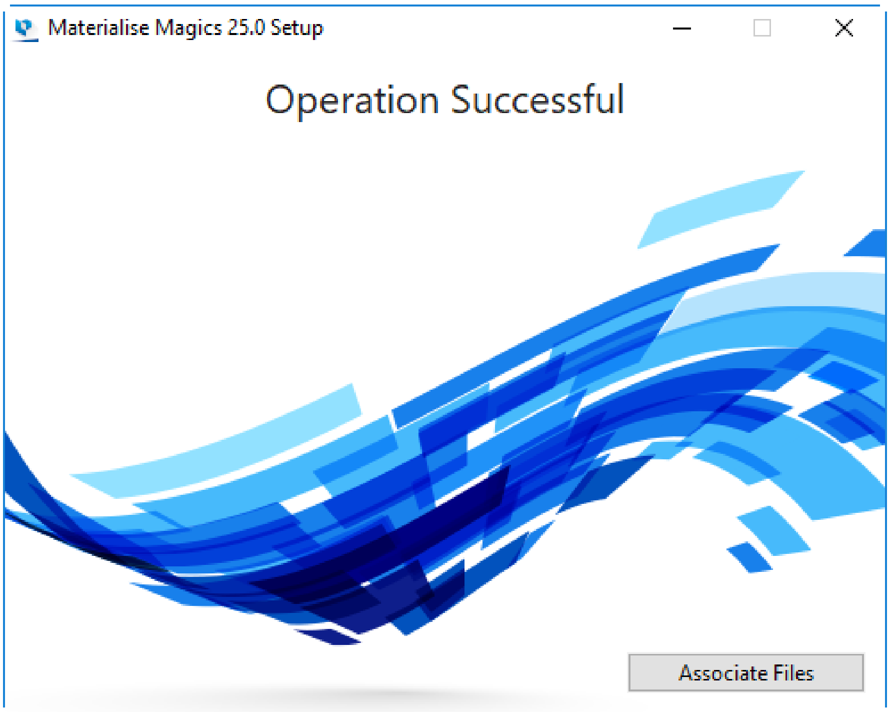
Select the nearest support office.

After reading the license agreement, select the “I agree with Materialise EULA and Microsoft DirectX EULA” checkbox and click on the ***Install*** button.

## 2.3 Step 3

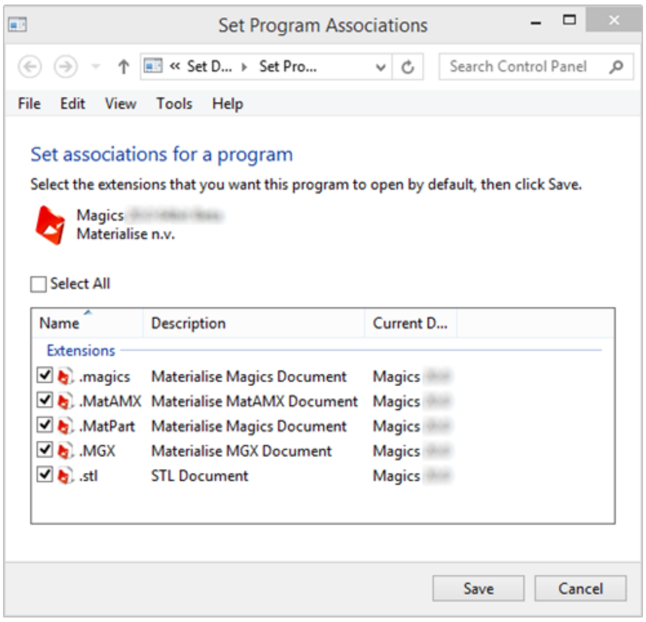



## 2.4 Step 4



The software is successfully installed. Click ***Associate Files*** to select the file types you wish to open with the Magics software.

## 2.5 Step 5




Select the file types you wih to open with the Magics software. It is advised to keep the standard settings. You can always change the associated files whenever needed via the Settings > File I/O > Fille associations menu

# 3 Chapter 3: Silent installation

Our standard installations work well for users who install our software themselves. Large companies with a centralized IT organization often would like to install software from a central location on a specific time. This is called “silent installation”. This allows the IT organization to install software quickly and easily over multiple computers without any inconvenience for the users.

It will allow the IT organization to write a simple program to do these installations using the commands described below. This can be done for nearly all our software, with the exception of some of our older products.

Below you can find the commands for the two installation packages which are used by Materialise as well as the command to connect Magics to your floating license server.

## 3.1 WiX package installation

WiX installers have an .exe extension and certain specific commands. Among these installers are the installers for Magics, the Build Processors and the Simulation plug-in. Most of the commands are common for the different Materialise products, but some are specific for Magics products.

### 3.1.1 Common commands

#### *3.1.1.1 Installation commands*

- /install - install (default)
- /repair - repair
- /uninstall - uninstall
- /layout <Directory> - create a complete local copy of the bundle in directory

#### *3.1.1.2 UI commands*

As default all the UI and all prompts are displayed. These commands will allow you to hide those.

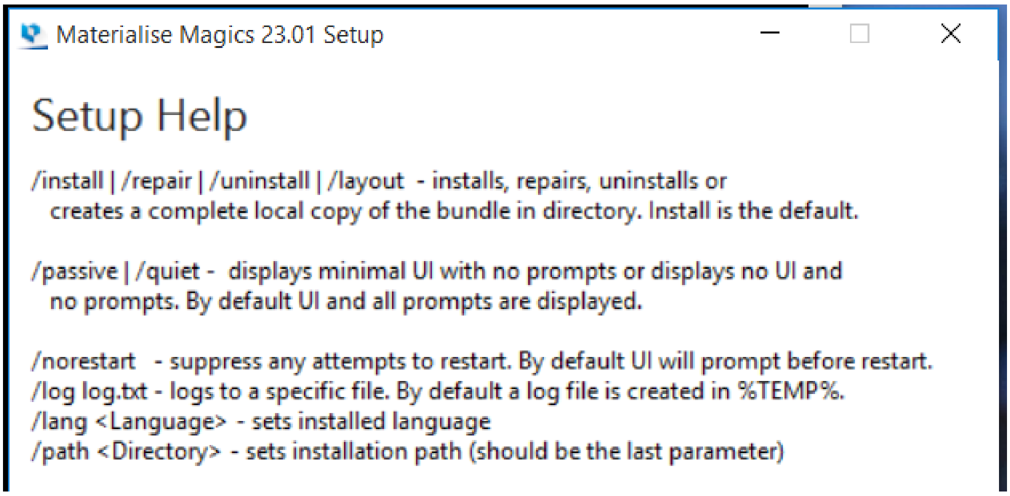
- /passive - displays minimal UI with no prompts
- /quiet - displays no UI and no prompts

#### *3.1.1.3 Additional commands*

- /norestart – suppresses any attempts to restart by the installer
- /log log.txt – logs to a specific file

#### *3.1.1.4 Setup help*

- /? – will provide you more information on commands




### 3.1.2 Product-specific commands

These commands are only relevant for Magics and MiniMagics. They are not applicable for e.g. the Build Processors and the Simulation module. If you would like to be sure if they are applicable to your product, please use the help command, as described above.

- /lang <Language> – sets installed language (e.g. German)
- /path "<Directory>" – sets installation path (should be the last parameter)

### 3.1.3 Examples

Magics_setup_23.0.1.19_x64.exe /install /quiet /norestart /lang German /path "C:\Program Files\Materialise\Magics 23.01"

SLMBuildProcessor_3.1.10_64bit.exe /uninstall /passive

## 3.2 MSI package installation

e-Stage, 3-matic and a number of our other products have a Windows Installer package, in the form of an .msi file. For these packages, different commands will need to be used. msiexec.exe is the receiver of these commands, and will activate the .msi files. This means all commands are aligned with the standard msiexec commands. The most important for the installation are described below.

## 3.2.1 Commands

### *3.2.1.1 Installation commands*

- /i - install
- /uninstall – uninstall

### *3.2.1.2 UI commands*

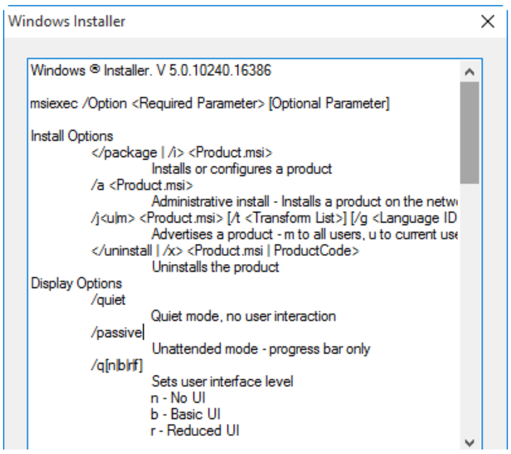
- /passive - displays minimal UI with no prompts
- /quiet – quiet mode, no user interaction
- /qn – displays  no UI

### *3.2.1.3 Additional commands*

- /norestart – suppresses any attempts to restart by the installer
- /log <Logfile> – logs to a specific file

### *3.2.1.4 Setup help*

- msiexec.exe /? – setup help: will provide you more information on commands




## 3.2.2 Example

msiexec.exe /quiet /norestart /i D:/e-Stage-7.0.4.157-x64.msi

## 3.3 Floating License activation on local computer

To activate the floating license together with the installation of Magics, you can use the command below. This is done using the Magics.exe which will appear in installation folder after installation will be finished.

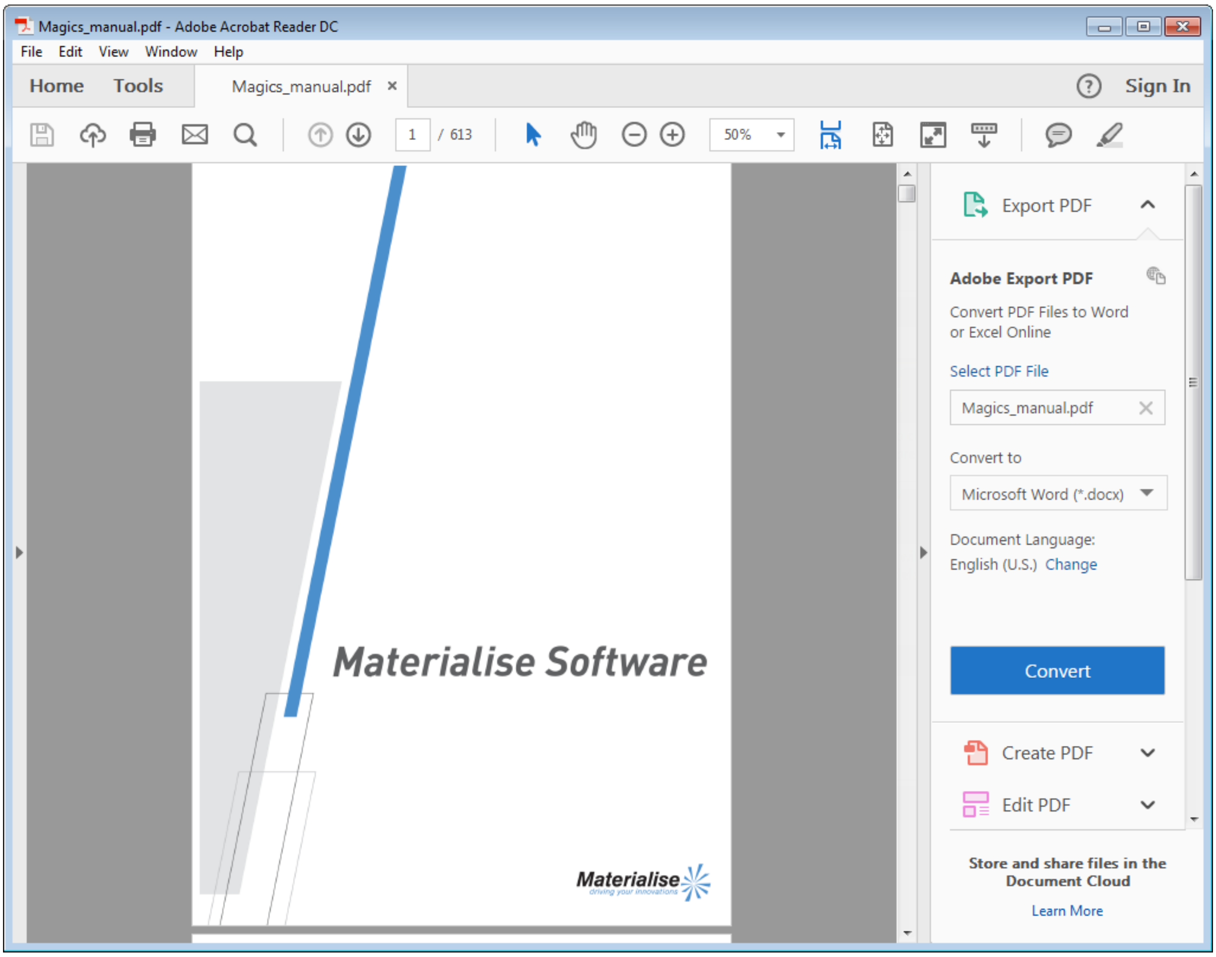
Command line:

- Magics.exe /flsregister {server_name}:{port}

# 4 Chapter 4: Using Help

For Materialise software support, please go to: https://help.materialise.com

The manual of Magics offers you a clear and easy way to search for more information about a function. In almost each dialog is a Help button present to open directly the Magics manual.



Remark: Bookmarks not enabled by default? Navigate to View -> Navigation panels -> Bookmarks

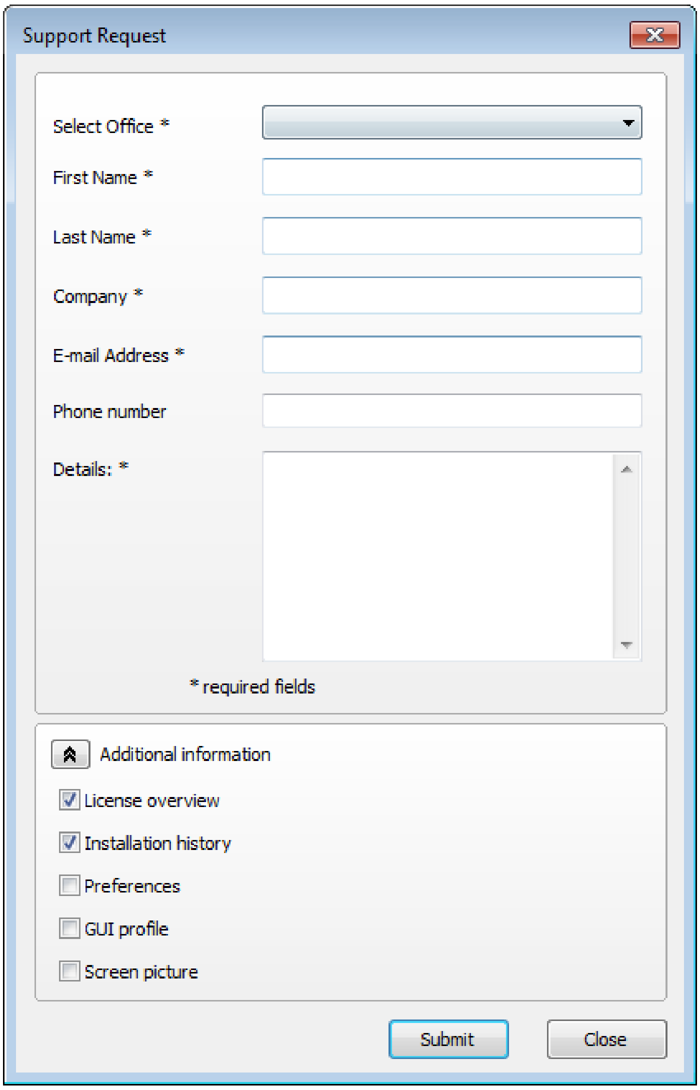
# 5 Chapter 5: Support Request

Send a support request automatically out of Magics to our customer support team.

## 5.1 Required information

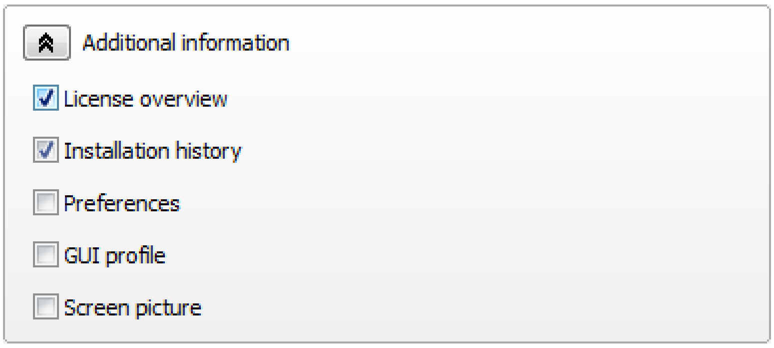
Fill out the support request form, select your nearest Materialise office and you can send an e-mail directly.

Please make sure the required fields are properly filled in. Our customer support team will then have all information to contact you as soon as possible.



## 5.2 Additional information

To make sure that our customer support team has enough information regarding the problem some additional information can be included. You can select to add additional information to your support request which will give the customer support team more information about your Magics configuration. By sharing this information it is more likely that your support case will be solved more swiftly.



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# Part II: Magics Features

# 1 Chapter 1: Quick Access Bar


## 1.1 New

Create a new Magics project. (CTRL+N)

## 1.1 Load Project

Load an existing project. (CTRL+O)

## 1.2 Save Project

Save the current project. (CTRL+SHIFT+S)

## 1.3 Save Project as

Save the current project and select the desired name, file format and location.

## 1.4 Import Part

Import an existing 3D model into the current scene.

## 1.5 Save Selected Part(s) As

Save the selected part(s) and select the desired name, file format and location. (CTRL+S)

## 1.6 Undo

With this command you can undo the previous action. All actions that change the STL file will be noted in a list, the Log Window (Menubar/View/Log Window). In case of a computer-crash when Magics is open, you will be able to recover the work you did before (auto-recovery). (CTRL+Z)

The undo and auto-recovery functions are default ON. If you would like to change this, go to Settings (Settings > General > Undo and Recovery)

## 1.7 Redo

The actions that were undone by the undo operations can be redone by redo. (CTRL+Y)

## 1.8 Select

Select part(s) (F2)

## 1.9 Unload Part

This command removes the selected parts. If the user has selected several parts, these parts are removed at once. The Unload function does not affect any platform settings. The user is prompted to save the parts that will be unloaded if they are changed. (CTRL+U)

## 1.10 Settings

Change Magics' settings

— See Settings, page 314

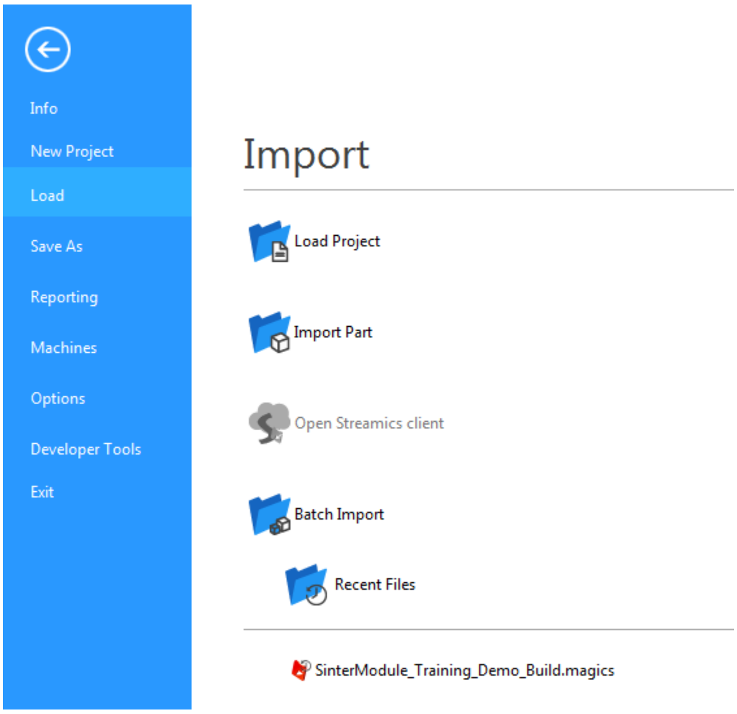
## 1.11 Quick Search

Search a functionality within Magics. Start entering the name of a functionality, and all relevant functionalities are instantly shown. Click on the desired functionality to directly activate. (SHIFT+Q)

# 2 Chapter 2: File

Via the File screen, you can import and export project files, load and save .mgx and STL files and import files that have a format different from .mgx and STL. Thanks to the e-mail functionality, you can send the loaded parts. You can generate documents about your projects that may include different snapshots of the file, and all kinds of RP related information. The print functionality is accessed via the Reporting section. The Load section gives also access to your recent opened or saved files.

The File screen:

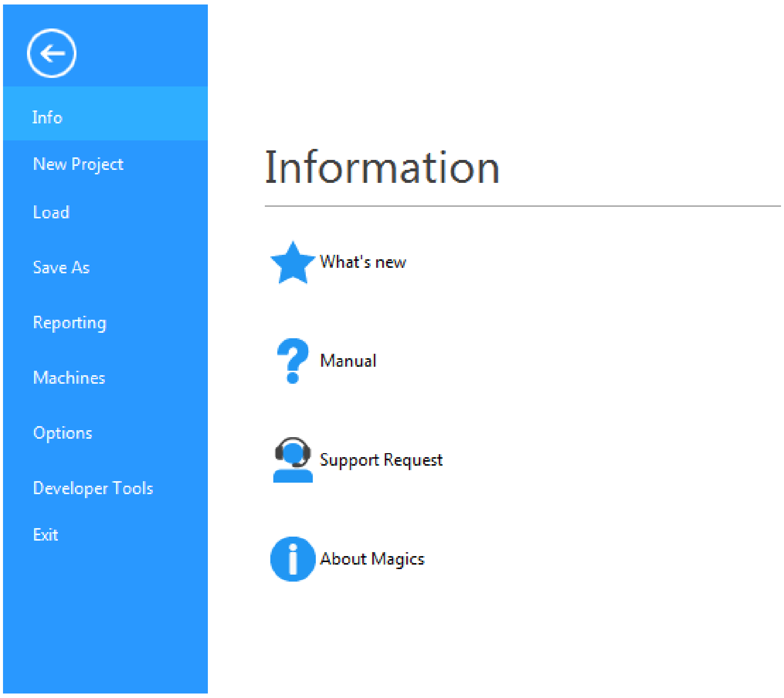



## 2.1 Info

In this section you can find more information on the Magics software:

- What's new: the new features in your Magics version, compared to previous versions
- Manual: Reference manual on the Magics software
- Support Request: contact info to request support from Materialise or its affiliates.
- About Magics: info about your currently installed Magics version and its active licenses.

The features of this section are equally available via the Options & Help ribbon.



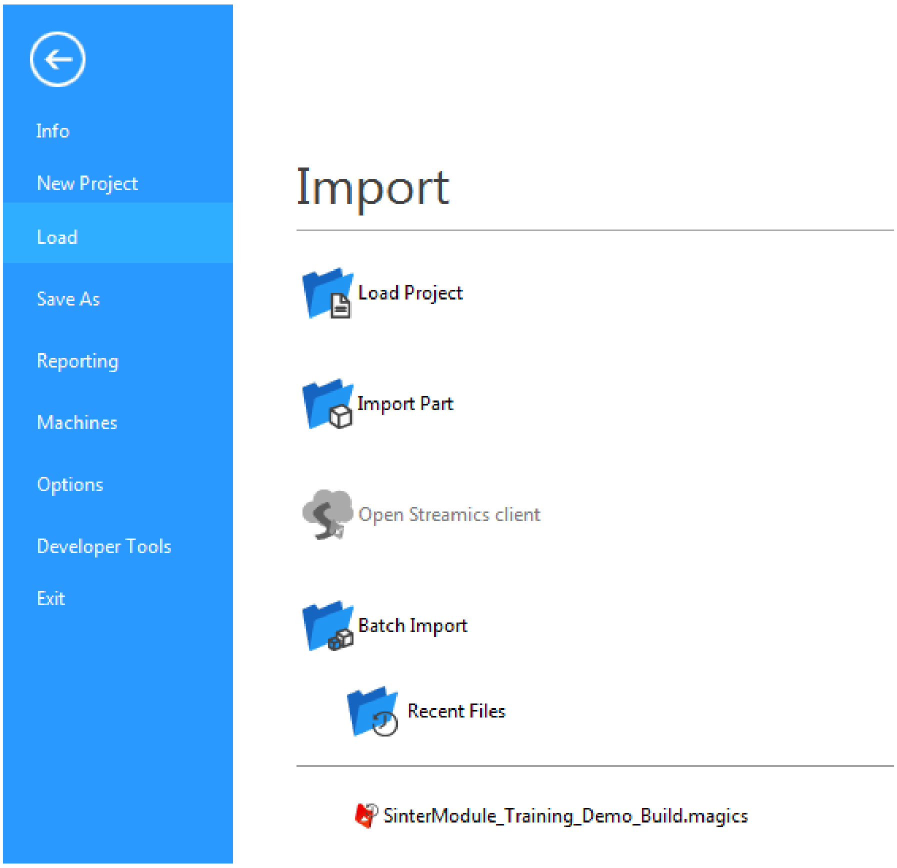

## 2.2 New

### 2.2.1 New Project

This command removes all parts from the current project and generates an empty project. The user is prompted to save the project (See Save Project, page 58) before the current platform is closed.

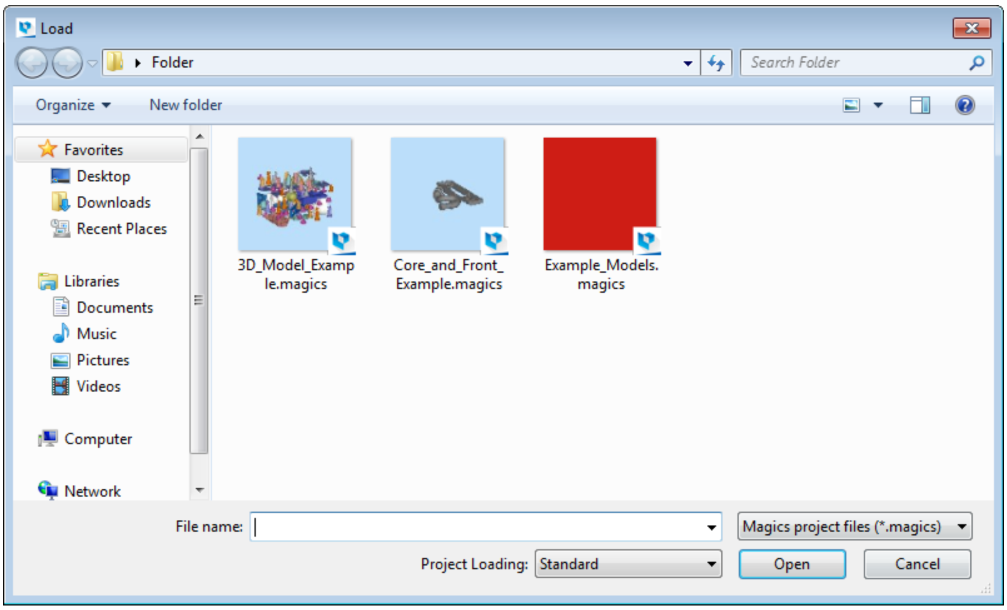
## 2.3 Load

Via this section you can load a project or import a part into an open project. You can also open a Streamics client. Your recently opened of saved files can be directly accessed in this section.




## 2.3.1 Load project

The Load Project command starts the standard dialog box to open files.



The following types of files can be loaded:

| | |
|---|---|
| Magics Project files | (*.magics) |
| Materialise AM Exchange files | (*.MatAMX) |
| AMF files | (*amf) |
| 3-matic project files | (*.mxp) |
| STL files | (*.stl) |
| Stl Zip files | (*.mgx) |
| Materialise RapidFit files | (*.mrf) |

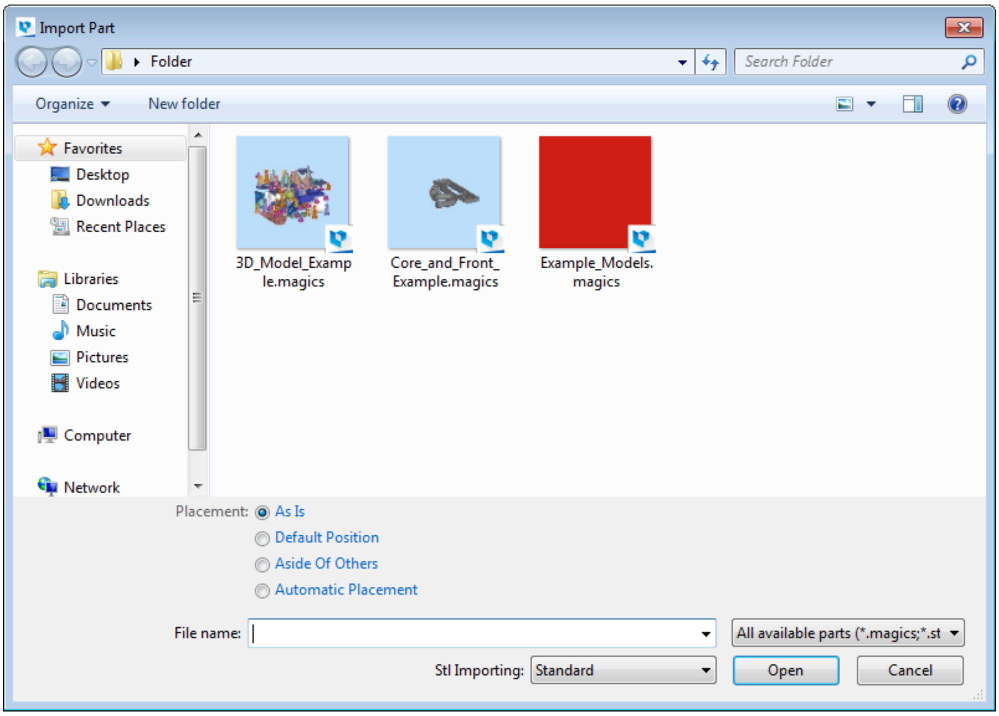
The memory state of the loaded project can be defined, the following states can be chosen:

| | |
|---|---|
| Standard | This is the standard memory state of a STL file. Magics knows the placement of the triangles and the mutual dependencies of the triangles. The user is able to perform actions on STL level (E.g. deleting triangles) |
| Compact | The STL resides in the memory as read-only, therefore it uses far less memory than the Standard memory state. Magics does not know the placement of the triangles nor the mutual dependencies of the triangles. The user is not able to perform actions on STL level. |
| On Disk | The STL is saved on disk and unloaded from the memory. The STL will stay in the project but the user can't perform any actions on it. |
| As Saved | The Project will be loaded as previously saved. |

The default memory state for the loaded project is defined in the Settings.

### 2.3.2 Import Part

 This command loads a part on the current platform from a selected location. If no machine is selected, the part can be processed also. To load several parts at the same time, the CTRL or the Shift button are used. In this case, the preview can't be used.




*<u>Remark</u>: By default MatConvert is included to import your files.*

The following types of files can be loaded (depends on your licenses):

| *Name* | *Extension* | *Extra Software* | *Comment* |
|---|---|---|---|
| STL or MGX files | *.stl, *.mgx | Not required | The MGX format is a compressed form of STL, which can compress a part 10 to 20 times, depending on the STL file. |
| Materialise AM Exchange file | *.MatAMX | Not required | |
| 3MF files | *.3mf | Not required | Version 1.1 is supported |
| AMF files | *.amf | Not required | |
| DXF files | *.dxf | Not required | Only 3D face DXF files can be imported |
| ZCP or PLY files | *.zcp, *.ply | Not required | Version 1.0 is supported |
| ZPR files | *.zpr | Not required | Version 1.2 is supported |
| Magics Project files | *.magics | Not required | The .magics format is a compressed format, containing next to the STLs in the workspace also all other information like support, fixtures, scenes, etc. |

| | | | |
|---|---|---|---|
| | | | It is possible to see a preview of the .magics project file in the windows explorer. (For Windows XP only when thumbnails are chosen and under Windows Vista: medium, large or extra-large icons. |
| IGES | *.igs, *.iges | IGES module | Version 5.3 is supported |
| Catia 4 | *.model, *.exp | Catia V4 module | Only Catia files until version 4.5x can be read. |
| Catia 4 model | *.model | Catia V4 module | Only Catia files until version 4.2x can be read. |
| Catia 4 export file | *.exp | Catia V4 module | Only Catia files until version 4.2x can be read. |
| Catia 5 part files | *.CATPart | Catia V5 module | This module can read Catia V5-files R10 to V5-6R2019 (R29) |
| Catia 5 product files | *.CATProduct | Catia V5 module | This module can read Catia V5-files R10 to V5-6R2019 (R29) |
| Catia 6 | *.3dxml | Catia V6 module | Versions R2010x to R2019x are supported |
| Pro/Engineer | *.prt* | Pro/E module | This module can read Pro/E files till version 16 until Wildfire 3 and Creo 6.0 |
| STEP | *.stp,*.step | Step Module | Versions AP 214 and AP 203 are supported |
| Unigraphics | *.prt | Unigraphics Module | Versions V15 up to NX 1872 Series until 1892 are supported |
| Parasolid | *.x_t | Unigraphics Module | Version V7 to V32 are supported |
| VDAFS | *.vda, *.vdafs | VDA module | VDAFS 1.0 and 2.0 are supported |
| VRML | *.wrl, *.vrml | Not required | VRML 1, VRML 2 & VRML 97 |
| 3DS | *.3ds, *.prj | Not required | Releases 1 to 4 are supported |
| OBJ | *.obj | Not required | Version 2.1 and 3.0 are supported |
| Rhino | *.3dm | Not required | 6th version of 3DM is supported |
| Materialise part file | *.matPart | Not required | |
| Materialise Kernal file | *.mdck | Not required | |
| ACIS SAT | *.sat | ACIS SAT module | Standard ACIS Text (SAT) files of versions up to 2019 1.0 are supported |
| Solidworks | *.sldprt, *.sldasm | Solidworks module | Versions 2009 to 2020 are supported |

| | | | |
|---|---|---|---|
| Google Sketch UP | *.skp | Not required | 64- bit; Versions up till 2020 |
| JT | *.jt | JT module | Versions up to 10.3 are supported |
| Common Layer interface | *.cli | Not required | Slices visualization only |
| 3D Systems Layer Contour | *.slc | Not required | Slices visualization only or convert to STL |
| Stratassys Layer Interface | *.ssl | Not required | Slices visualization only |
| Fockele & Schwarze | *.f&s | Not required | Slices visualization only |
| 3D Systems Layer Interface | *.sli | Not required | Slices visualization only |
| Autodesk Inventor | *.ipt | Not required | Version 9 to 2020 are supported |
| Revit | *.rvt | Not required | Versions 2015 to 2020 are supported |
| Solid Edge | *.par | Not required | Versions 10 to 2020 are supported |
| X3D | *.x3d | Not required | Version 3.3 is supported |

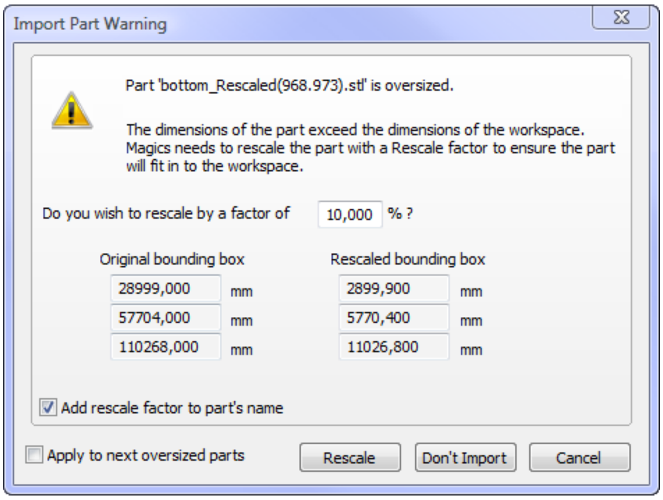
*Remark: All formats can be imported by dragging and dropping the files in Magics.*

The memory state of the loaded part can be defined, the following states can be chosen:

| | |
|---|---|
| Standard | This is the standard memory state of a STL file. Magics knows the placement of the triangles and the mutual dependencies of the triangles. The user is able to perform actions on STL level (E.g. deleting triangles) |
| Compact | The STL resides in the memory as read-only, therefore it uses far less memory than the Standard memory state. Magics does not know the placement of the triangles nor the mutual dependencies of the triangles. The user is not able to perform actions on STL level. |
| On Disk | The STL is saved on disk and unloaded from the memory. The STL will stay in the project but the user can't perform any actions on it. |

When trying to load a part in standard mode that is too large a dialog box will pop up.

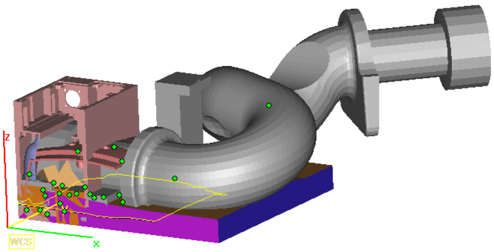
An automatic rescale will be performed on the part. (For more information, see Rescale, page 196)

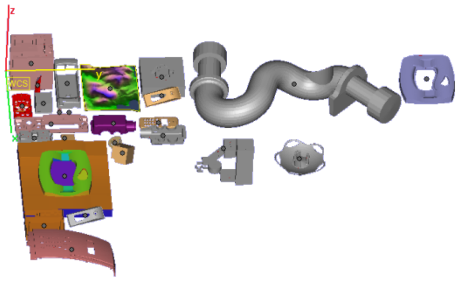



| | |
|---|---|
| Rescale factor | Magics proposes a factor to use to rescale the part so it will fit within the workspace. |
| Original bounding box | Represent the current size of the parts bounding box |
| Rescaled bounding box | Represents the parts bounding box after the rescale take place |
| Add rescale factor to part's name | The used rescale factor will be added to the part name |
| Apply to next oversized parts | The same rescale factor will be used for other upcoming oversized parts |
| Rescale | The actual rescale is performed |
| Don't import | The part isn't rescaled and will not be imported |

The default memory state for the loaded part is defined in the Settings.

— See Settings, page 314

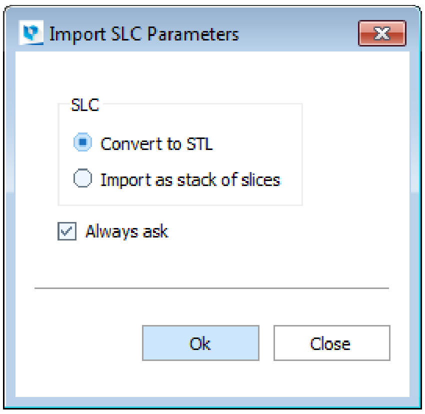
| | |
|---|---|
| As Is | The original STL-position is maintained |
| Default Position | The part is placed at the default position. This default position is defined in the Machine Properties and represents the minimal X, Y and Z of a part. (default position: Xmin = 10mm; Ymin=10mm; Zmin = 10mm)  |

| | |
|---|---|
| Aside Of Others | Parts are loaded one after the other while the original Y-position is maintained. If a line is full, a new line is started.  |
| Automatic Placement | The part(s) will be added using automatic placement. The parts that already are loaded will not be moved. This can be done later by selecting all the parts and using Automatic Placement of the Tools menu. Changing the settings for automatic placement can be done in the Nesting settings (see Parts placement page, page 244).  |
| Preview | If you want to see a preview of the selected STL-file, check the Preview checkbox. |

## 2.3.3 Slice import

Slice files can be imported in the base module of Magics.

The slice file will be visualized in Magics, but no further action can be performed.



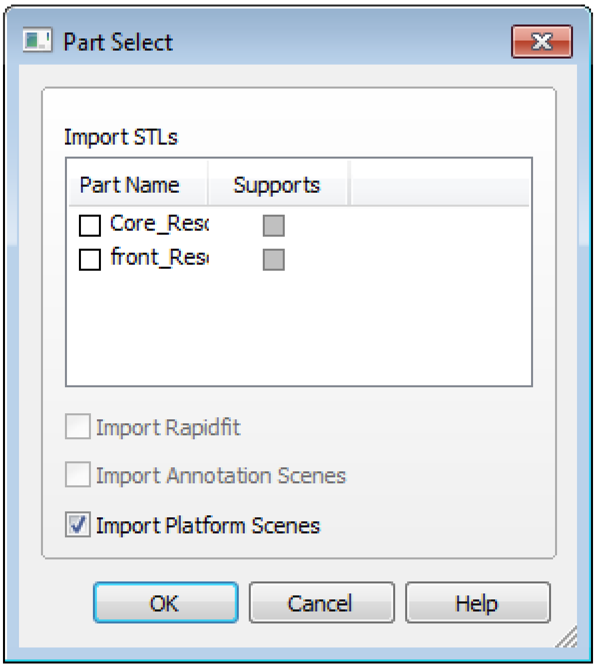

| | |
|---|---|
| Convert to STL | The imported slice file will be converted to a STL file. |

| | |
|---|---|
| | This is only possible with SLC files and an extra license. |
| Import as stack of slices | Slices are imported and visualized. |

*Remark: Slices can only be visualized when working in a Platform Scene. To visualize the slices, the slice preview must be switched "ON" in the View pages Toolpage.*

### 2.3.4 Loading Magics Project Files with Load Part

The user is able to load a Magics Project File through the Load Part operation. A dialog will pop up presenting the contents of the Magics Project File.




| | | |
|---|---|---|
| Import STL's | This list contains all the STL's in the Magics Project File. | |
| | Part Name | The part name of the parts in the Magics Project File. The user is able to check the parts that he wants to load. |
| | Supports | This column displays whether there is support for the part. The user is able to import the support for every single part. |
| Import RapidFit | The user can load the RapidFit information for the whole project. | |
| Import Annotation Scenes | The user can load the accompanying Annotation Scenes | |

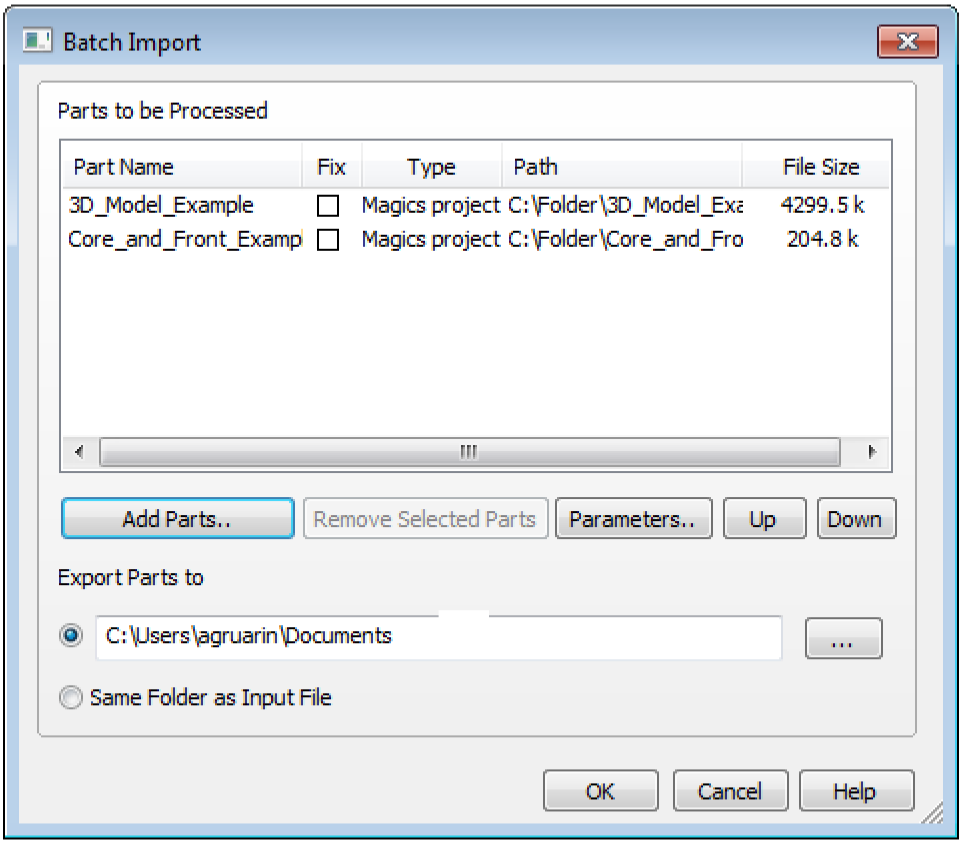
| | |
|---|---|
| Import Platform Scenes | The user can load the accompanying Platform Scenes and Virtual Copies. |

### 2.3.5 Batch Import

This command loads automatically CAD, STL, MGX and *.MAGICS files on the current platform from a selected location. All CAD files that are loaded are translated into STL-files. If no machine is selected, the part can be processed also. To load several parts at the same time, the CTRL or the Shift button are used. In this list, you can select parts by highlighting a row. The same type of files can be loaded as with the import part.

This command can save you a lot of time. For example: You need to load a large amount of files. You can specify which files need to be loaded, the files can be loaded overnight, and the next morning all files can be imported in Magics.

This command is only available with an additional license.




| | | |
|---|---|---|
| List<br><br>The list contains all parts that you added to the queue.<br>Magics will convert these files from top to bottom | | |
| | Part name | The name of the part. |

| | | |
|---|---|---|
| | Fix | When the checkbox is checked, the part will be fixed after importing, using the parameters of the parameters Dialog box.<br>The best is to use this function only for parts you know. The automatic fixing can change the geometry of a part. |
| | Type | The type of CAD-file. |
| | Path | The location of the CAD file. |
| | File Size | Size of the selected part in KB. |
| Add parts | With this button, you can add a CAD-part to the list.<br>A dialog box opens, where you can select the parts you want to add to the import-list. | |
| Remove selected parts | Use this button to remove the selected files from the list. | |
| Parameters | Opens the parameters-Dialogue box | |
| Up | Move a part upwards in the list so it will be converted earlier. If you want | |
| Down | Move a part downwards in the list so it will be converted later. | |
| Export parts to | | |
| | | Specify a folder to export the file to.<br>Use Parameters to set its default value |
| | Same folder as Input File | Export the files to the same folder as the Cad-file |

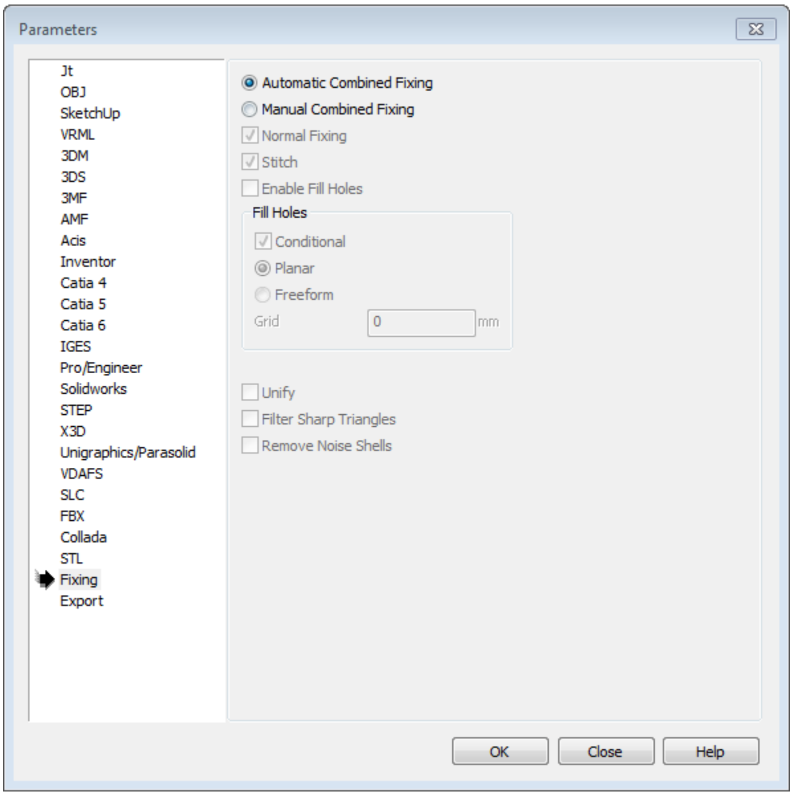
### *2.3.5.1 Parameters*

#### 2.3.5.1.1 Import parameters

Here you can specify the parameters for the files you want to load. You can apply these parameters for all the files in the list.

— See Import Part, page 46 for the file types.

### 2.3.5.1.2 Fixing parameters




Here you can select in what way the file is fixed after it's imported.

The fixing algorithm are similar as in the FW, there are 2 choices.

#### 2.3.5.1.2.1 Automatic Combined Fixing

If selected, Magics will do a predefined list of fixing actions. Some actions are conditional, this means that the action will only be performed when Magics is sure that the result will be ok.

As mentioned above, be careful with this option. Only use it on parts you know.

#### 2.3.5.1.2.2 Manual Combined Fixing

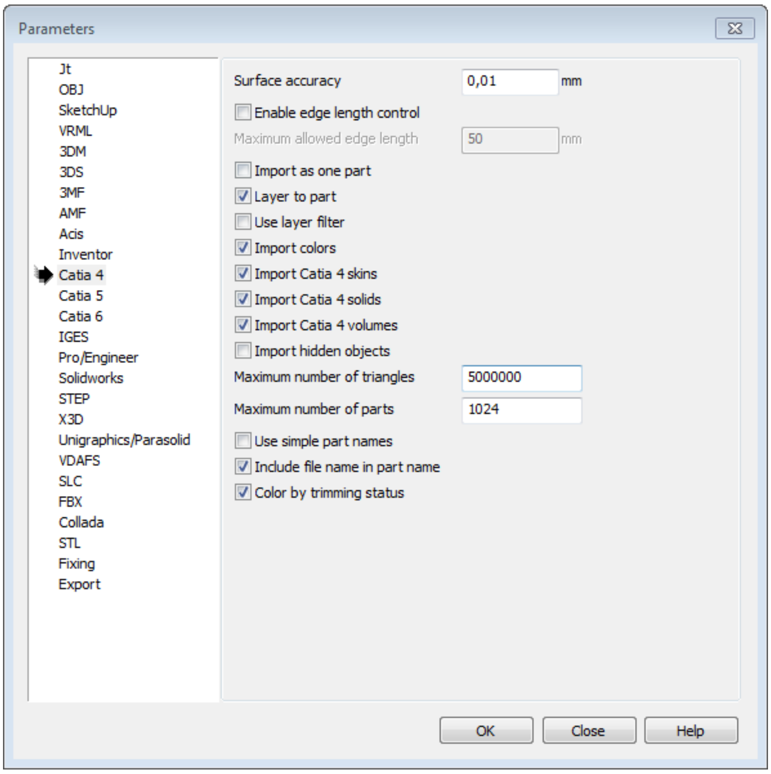
Instead of the fully automatic fixing algorithm, it might be safer to use a manual selection of fixing functionality.

The user can decided which fixing functions he wants to apply.

| | |
|---|---|
| Normal Fixing | A normal fix is applied. |
| Stitch | A stitching is applied with the estimated stitching tolerance |
| Fill Holes | All contours that seem to be holes are filled automatically. (Type of hole fixing see combined fixing) |
| Unify | This will remove all internal geometry and intersecting triangles. This operation will only be done if the geometry allows it. |
| Filter Sharp Triangles | Sharp triangles will be removed to improve surface quality. |
| Remove Noise Shells | The automatic removal of detected noise shells, these noise shells make no geometrical sense: they are not connected to the bigger part, nor have a volume. |

### 2.3.5.1.3 Export - parameters

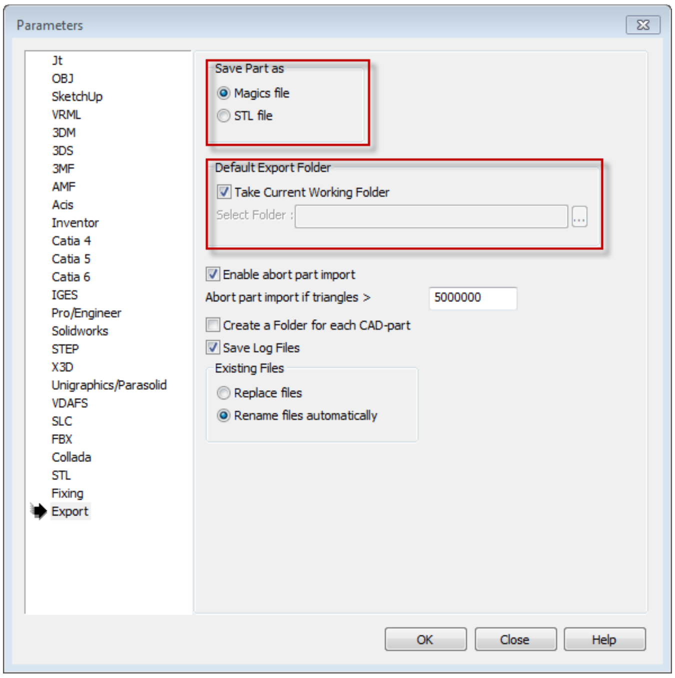
Here you can set how the converted CAD-files are saved to disk.




### 2.3.5.1.4 Default Export Folder

| |
|---|
| Default Export folder |

| | | |
|---|---|---|
| | Take current working folder | Export the files to the current working folder. |
| | | Specify a folder to export the file to.<br>Each time, it will take this folder. |
| Abort part import after … | Set a limit of triangles. When the limit is reached, Magics will stop the import and moves to the next part in the queue. This option can be set when you need to load a very large file, to avoid that all the memory is being used. | |
| Create a folder for each CAD-part | For each imported part, a folder is created. The name of the folder is the name of the CAD-part. | |
| Save log files | For each part, a log file is saved in the same folder as the Magics file (or STL) is saved.<br><br>This log file contains:<br>— the CAD File<br>— To which version it is converted.<br>— When it is converted<br>— Result of the batch import | |
| Existing Files | | |
| Replace files | Files that already exist in the chosen folder will be overwritten. | |
| Rename files automatically | Files that already exist in the chosen folder will be renamed automatically. | |

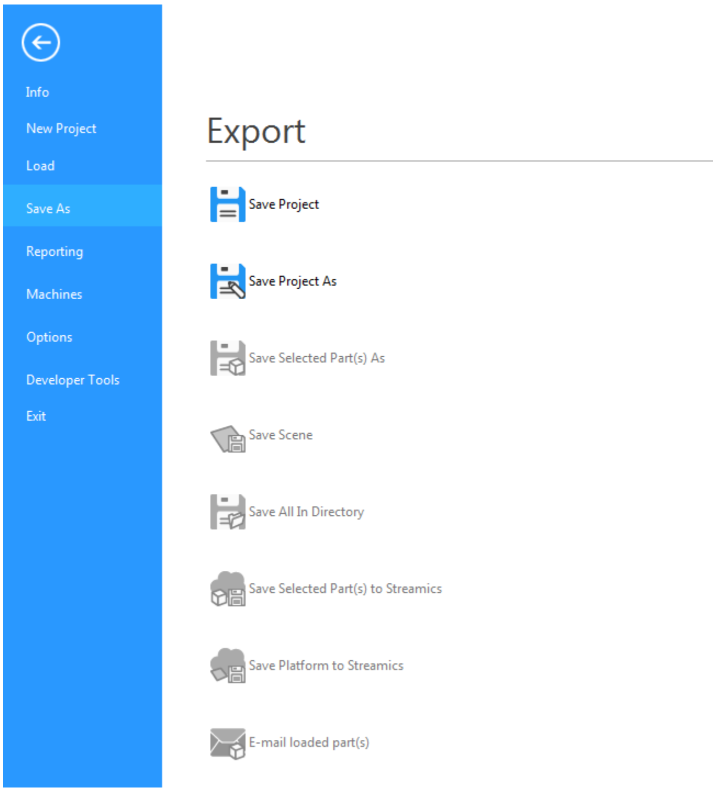


### 2.3.6 Recent Files

This list shows the most recent files you used in Magics.

## 2.4 Save As

Via this section you can save your opened project, select part(s) or scene. You can save selected pat(s) or the platform to Streamics. You can also e-mail loaded part(s).




### 2.4.1 Save Project

 When you have prepared a project in Magics, you can save it to disk in order to load it again later on. In order to save the project, the following types can be chosen:

| | |
|---|---|
| Magics Project files | (*.magics) |
| STL Zip files | (*.mgx) |

#### 2.4.1.1 Magics Project Files

The Magics Project File is a dedicated file format for Magics. The Project File can contain information concerning:

— STL's
— Support
— RapidFit
— Measurements and annotations
— Machine information
— Annotation and Platform Scenes

The user is able to save a whole project instead of saving all STL's and support separately. Another advantage of the Magics Project File is that the information is stored together with the preprocessed data, so the loading of a project file is much faster than loading the individual STL's. The Magics Project File format is also a compressed format, dedicated for the RP industry.

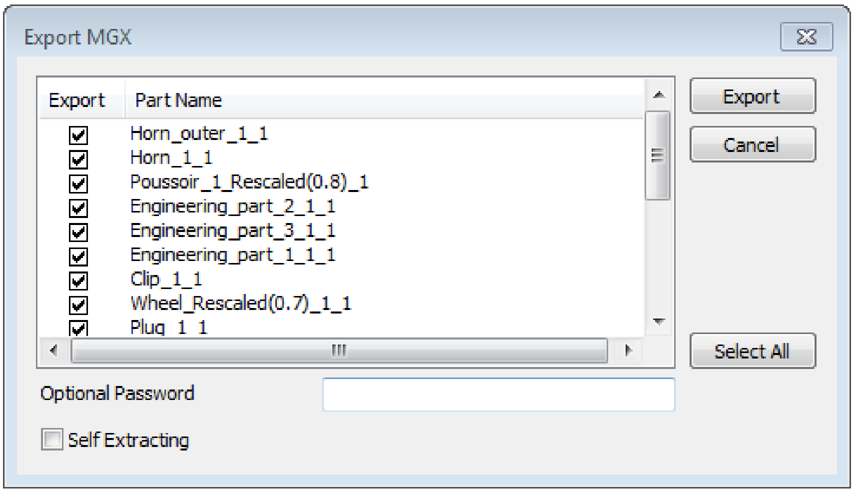
For support, Magics will automatically extend the project name with '_sup' if this option is checked in the Settings. So the reader is noticed that a file contains support data.

— See Settings, page 314

#### 2.4.1.2 Stl Zip files

This will save the project as an .mgx file. The .mgx format is a compressed form of STL, which can compress a part 10 to 20 times, depending on the STL file.

You can choose which loaded files you want to export to the .mgx file by means of the dialog in the following picture:




| | |
|---|---|
| Export column | This column contains flags for each part you want to export. |
| Part Name column | The part names identify the parts. |

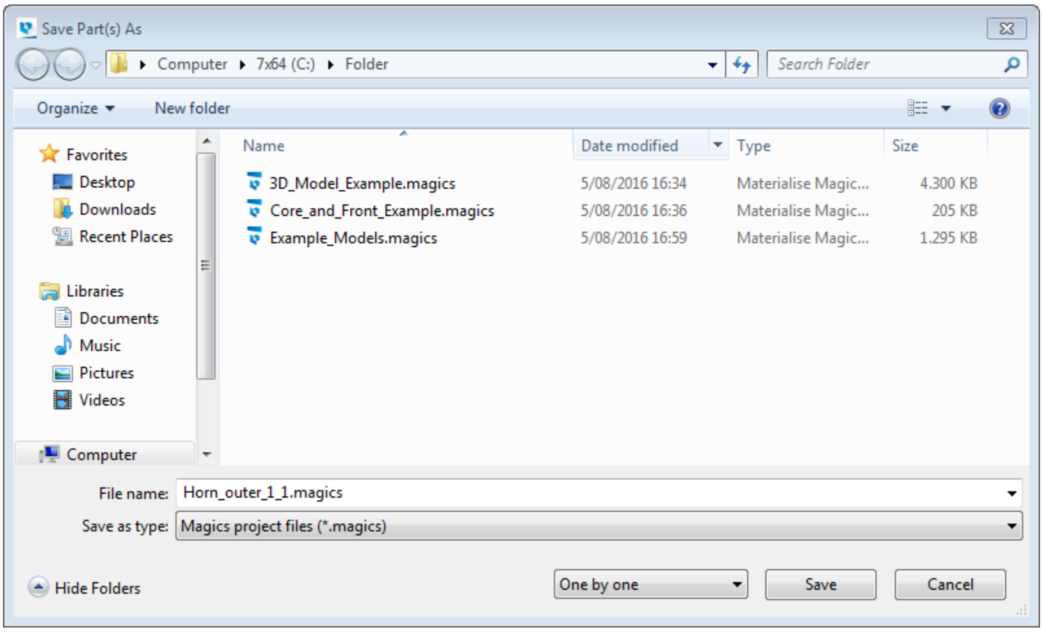
| | |
|---|---|
| Optional Password | The password is used for encryption so you can send these files safely over the Internet. |
| Self-extracting | When this is checked, Magics will create an executable file, which contains the .mgx file. When you run this executable, the STL's contained will be extracted automatically. You can use this to send the MGX-files to people who don't have software to read MGX-files. |
| Export | By clicking Export you can browse to the place where you want the .mgx file to be written and type in the filename. |

### 2.4.2 Save Project As

Save Project As allows you to save the project with another name, it contains the same functionality as Save Project.

### 2.4.3 Save selected part(s) As

With this command, the active (selected) files are saved. The destination of the saved parts can be changed when using this option. Each part is saved in a separate file. To save all parts into one single file, first merge the parts and save it subsequently.




The file can be saved to the following file types:

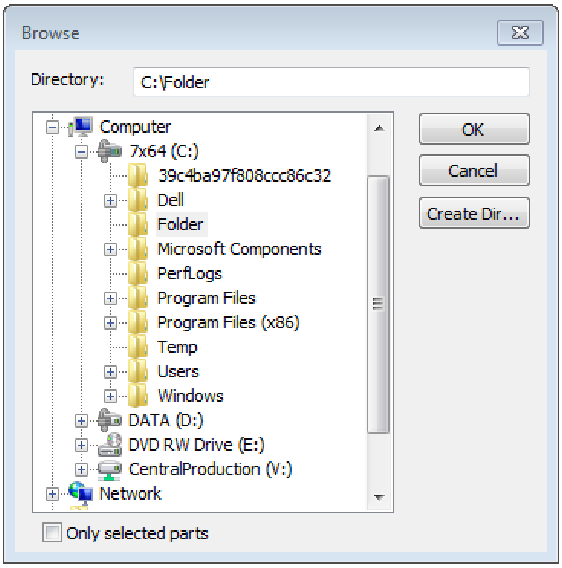
| *Name* | *Extension* | *Extra Software* | *Comments* |
|---|---|---|---|
| Magics Project files | *.magics | Not required | |
| STL files | *.stl | Not required | |
| STL (ASCII) files | *.stl | Not required | |
| STL (COLOR) files | *.stl | Not required | |
| Materialise AM exchange files | *.MatAMX | Not required | |
| AMF files | *.amf | Not required | |
| MGX files | *.mgx | Not required | |
| | | | |
| Materialise part files | *.matPart | Not required | |
| PLY | *.ply/ *.zcp | Not required | |
| DXF files | *.dxf | Not required | |
| ZPR files | *.zpr | Not required | Allows you to get colored parts on certain RP-machines. |
| VRML files | *.wrl | Not required | |
| 3D PDF files | *.pdf | Not required | |
| Iges Wireframe files | *.igs | IGES module | The wireframe of the parts can be exported to an IGES-file |

### 2.4.4 Save scene

Save the active scene.

### 2.4.5 Save All in Directory

Save all open files, project, parts or selected parts in a directory. You can use an existing directory, or create a new one




### 2.4.6 Save Selected Part(s) to Streamics

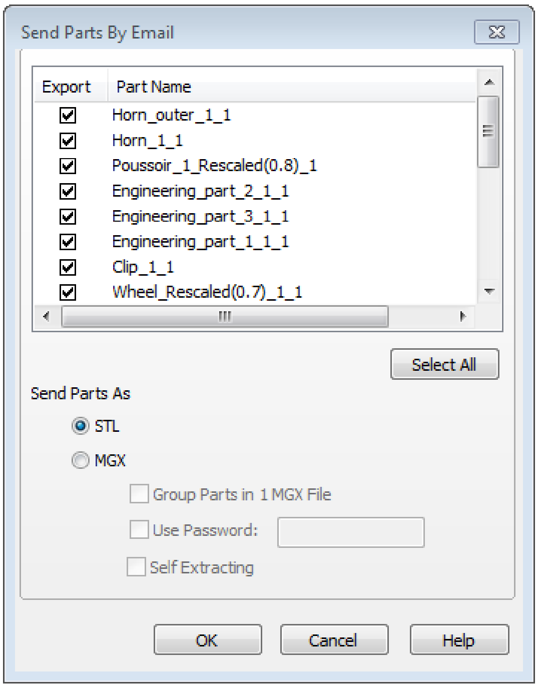
Save selected part(s) to Streamics

### 2.4.7 Save Platform to Streamics

Save the platform to Streamics

### 2.4.8 Email Loaded Part(s)

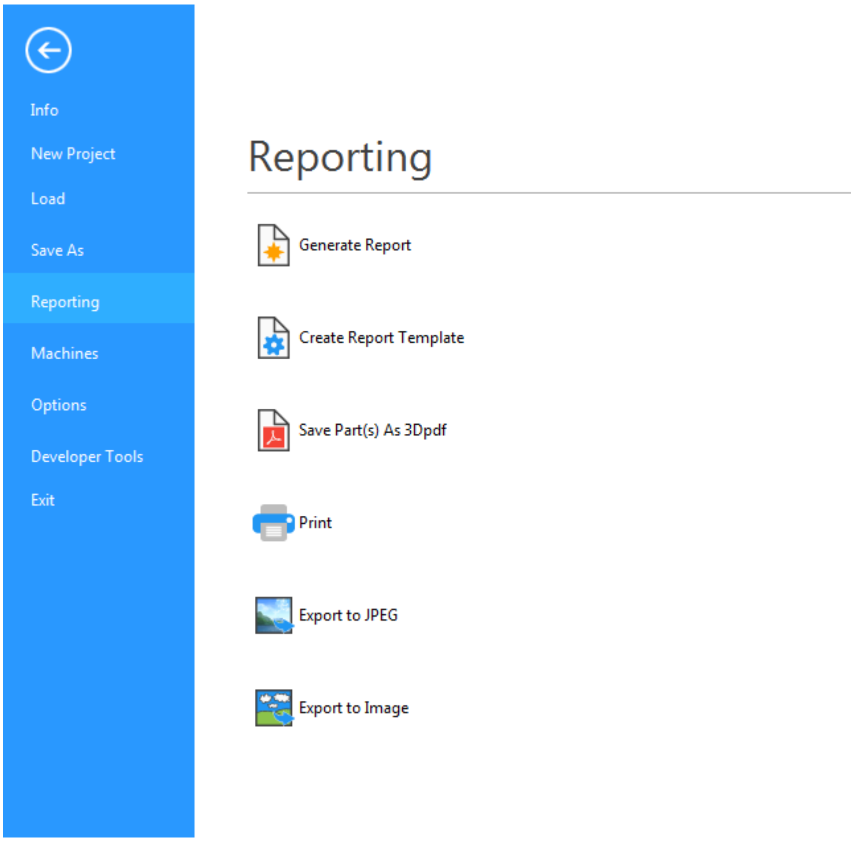
You can send the currently loaded parts.




| | | | |
|---|---|---|---|
| List | | | |
| | Export | Indicate the parts that you want to send. | |
| | Part name | The name of the part. | |
| Select All | Select all parts | | |
| Send Part As | | | |
| | STL | The parts are sent as STL's. | |
| | MGX | Group Parts | Groups the parts in 1 MGX file. |
| | | Use Password | The password is used for encryption so you can send these files safely over the Internet. |
| | | Self-Extracting | When this option is checked, Magics will create an executable file, which contains the MGX-file. When you run this executable, the STL's contained will be extracted automatically. You can use this to send the MGX-files to people who don't have software to read MGX-files. |

## 2.5 Reporting

In the Reporting section, you can generate a report, create a report template, save part(s) as 3Dpdf, print or export a view.




### 2.5.1 Generate Report

Magics can use Microsoft WORD and EXCEL templates to generate reports. In these templates some specific tags are used. When generating the report, these tags will be replaced by the value that they are representing. Off course, you have the freedom to create the templates yourself.

Choose the template Magics should process. When processing the template, Magics will replace the tags by the values they are representing.

### 2.5.2 Create Report Template

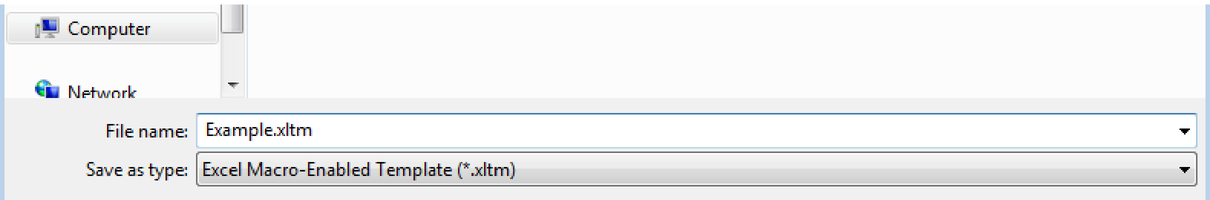
Magics will start the desired template in Microsoft Word or Microsoft Excel for further editing. 'Start here' is an empty template with all the tags in the menu. For Office 2007 these tags can be found under the Add-Ins menu, older version of Office can find the tags under the Insert menu.

Save the template you made in the directory C:\Program Files\Common Files\Materialise\Templates.

### 2.5.2.1 *The Templates*

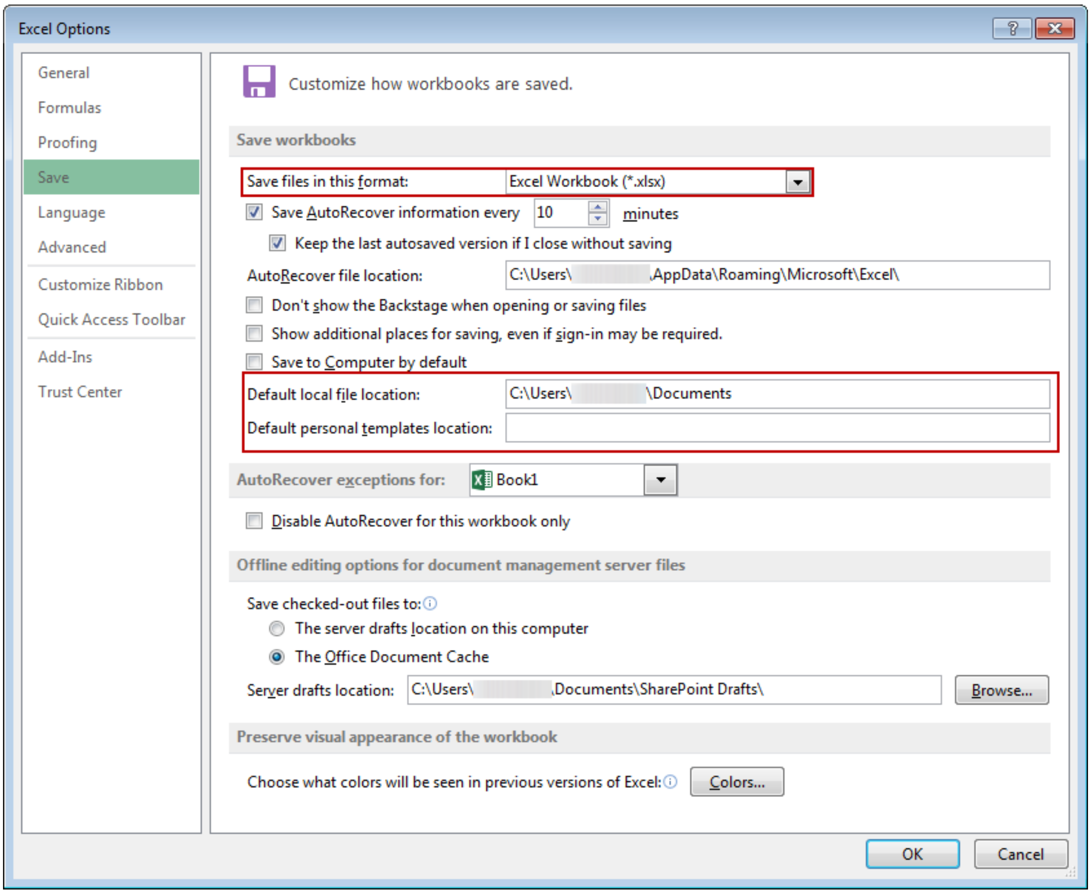
#### 2.5.2.1.1 Saving a Report Template

When saving your own report template, the file type has to be changed to "Excel Macro-Enabled Template (*.xltm)".

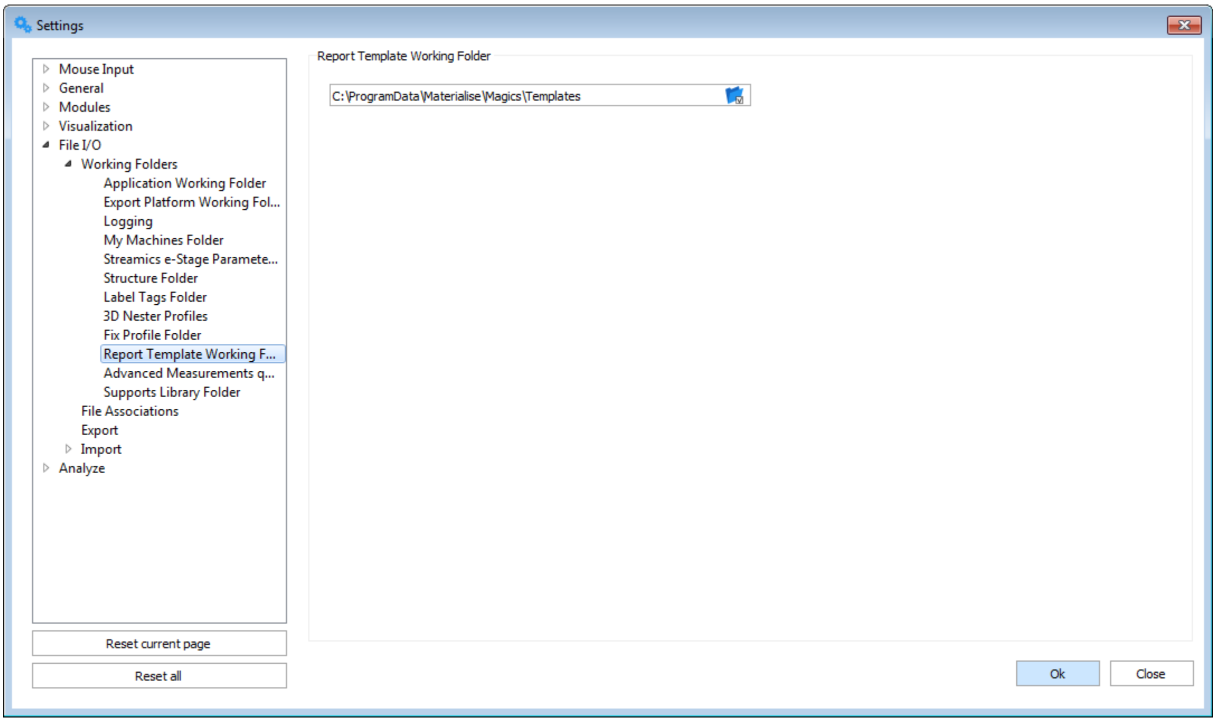



<u>*Remark*</u>: By default, selecting this file format will change the current folder to "C:\Users\[username]\Documents\Custom Office Templates". This is standard Excel-behavior and cannot be changed by Magics. Because of this, it is easier to select the "Excel Macro-Enabled Template" first, and only then navigate to the desired save location.

If you often create templates, changing the default save format and the default templates location might speed up your workflow. This can be done in Excel by going to File -> Options -> Save.




Alternatively, it is also possible to change the default Report Template Working Folder in Magics by going to Settings -> File I/O -> Working Folders -> Report Template Working Folder. Using “C:\Users\[username]\Documents\Custom Office Templates” here can also result in a smoother workflow.




#### 2.5.2.1.2 Tags

A tag is code representing a certain value; Magics will scan the document, recognize the tags and replace them with the wanted value. You have 2 kinds of tags.

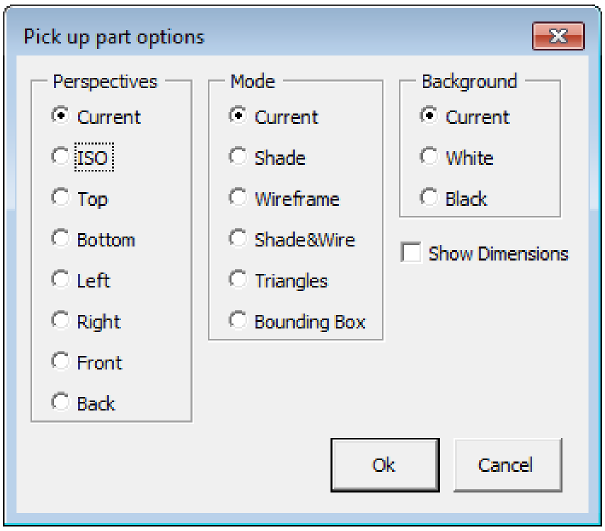
##### 2.5.2.1.2.1 Text

Text tags are tags, which will be replaced by text. They begin with %% and ends with %%. In between, the property is placed (for example: %%SurfaceArea%%). These tags can be inserted using the insert Materialise field's menu or just by typing the right syntax.

##### 2.5.2.1.2.2 Pictures

You can also insert pictures (screenshots). They are inserted with a menu. The macro will place a dummy JPEG where the screenshot shall come. When Magics is using the template to generate the document, he will replace this dummy JPEG by the wanted view. A screenshot can only be inserted using the insert Materialise fields menu.

In Office 2000 – 2003 you can find the Materialise fields under the Insert menu. In Office 2007 they can be found under the Add-Ins menu.



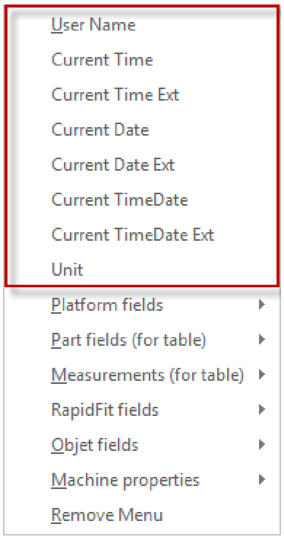

| | |
|---|---|
| Perspectives | In this column, you indicate which view you want. You will recognize the standard views (ISO, top, bottom, etc...). The Current will be the view that is shown in Magics when generating the document. |
| Mode | You can just take the current active mode or you can make sure that a certain mode (shaded, shaded and wireframe, etc.) will always be used. |
| Background | You can use the current background color but sometimes it can be better that the background color is forced to be white or black. |
| Unzoom | Unzoom will always do an unzoom before taking the screenshot. |
| Show platform | The platform can either be shown or hidden in print screens |

A JPEG will be inserted; the entered properties just entered are linked to the JPEG. You can now resize, move, align, etc. the JPEG. When generating the view, Magics replaces this dummy image by the selected view with exactly the same position and size. The properties of the JPEG can be reviewed by using the 'show all shape names' dialog. In Office 2000 – 2003 you can find the Materialise fields under the Insert menu. In Office 2007 they can be found under the Add-Ins menu.

### 2.5.2.1.2.3 List of tags

#### *2.5.2.1.2.3.1 General tags*

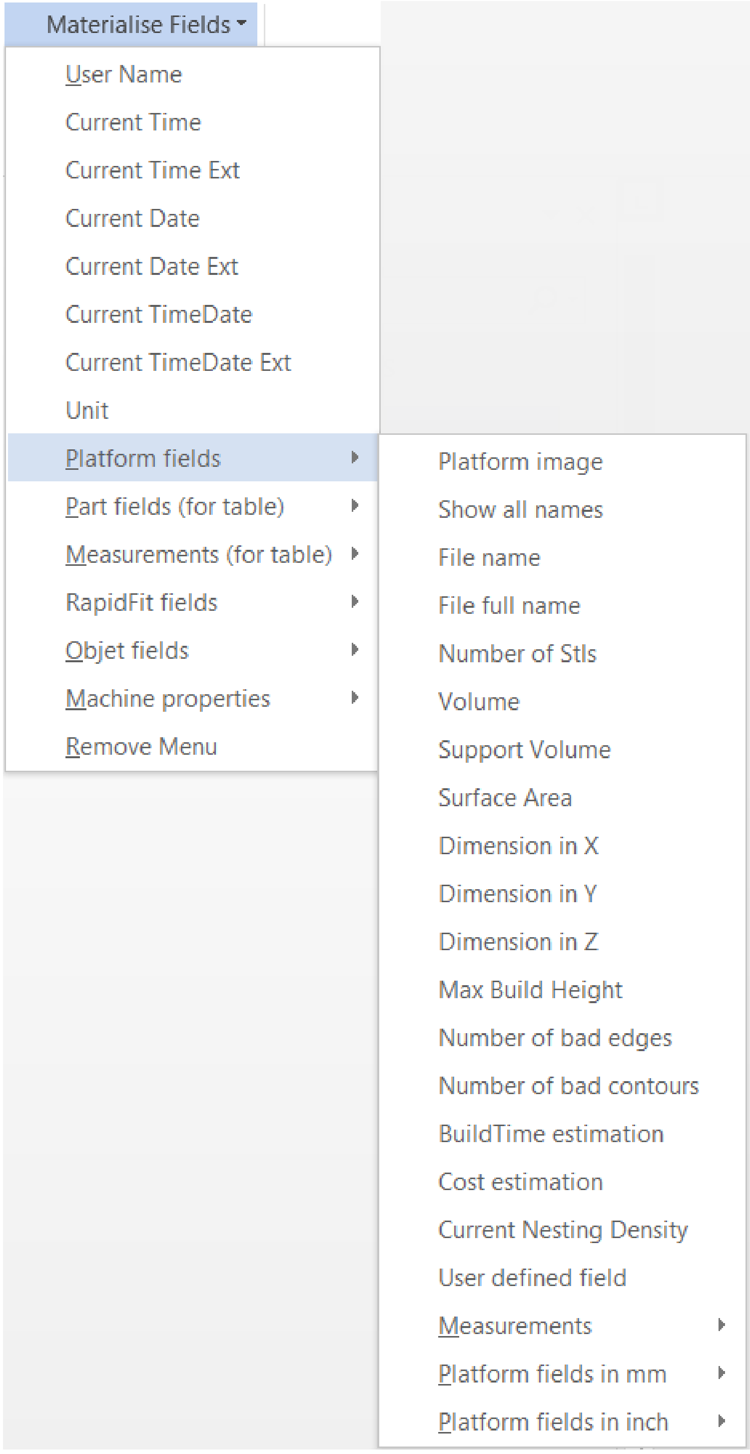
These tags are representing general information.




| *Tag* | *Description* | |
|---|---|---|
| %%UserName%% | The user name that is currently logged on | |
| %%CurrentTime%% | The current time<br>Extension:<br>%%CurrentTime:%H:%M:%S%% | |
| | %H | Hours |
| | %M | Minutes |
| | %S | Seconds |
| %%CurrentDate%% | The current date<br>Extension: %%CurrentDate:%A, %d %B, %Y%% | |
| | %A | Name of the day |
| | %d | Day (number) |
| | %B | Month (name of the month) |
| | %Y | Year |
| %%CurrentDateTime%% | The current date and time<br>Extension :<br>%%CurrentDateTime: %H:%M:%S , %A, %B %d, %Y%% | |
| | %H | Hours |
| | %M | Minutes |
| | %S | Seconds |
| | %A | Nam of the day |
| | %B | Month (name of the month) |
| | %d | Day (number) |
| | %Y | Year |
| %%Unit%% | The current unit size used in Magics (mm or inch) | |

### 2.5.2.1.2.3.2 Group tags

These tags are representing the properties of groups of STL-files.

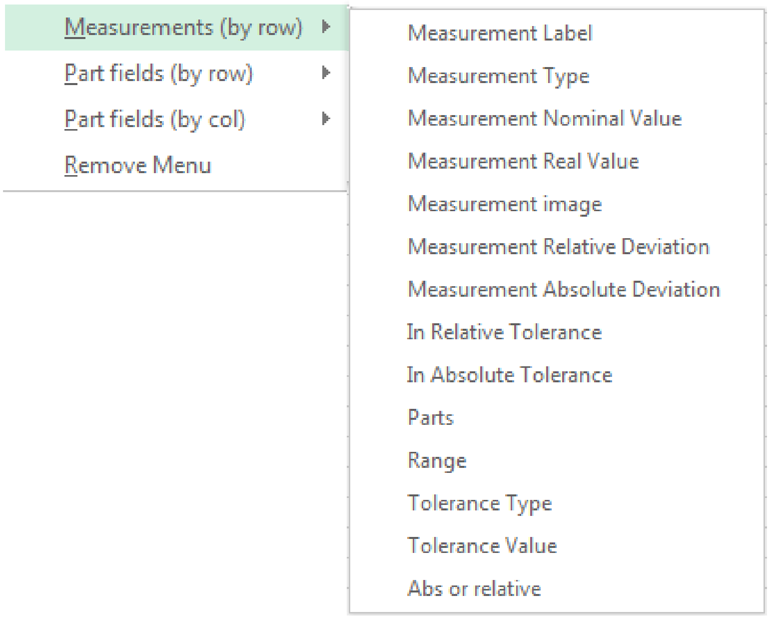



| *Tag* | *Description* |
|---|---|
| Common view | |

| | |
|---|---|
| Show all names | |
| %%FileName%% | The name of the platform file(only useable in the RP-version) |
| %%FileFullName%% | The name of the platform file + path(only useable in the RP-version) |
| %%NumOfStl%% | The number of STL-files in the active scene at the moment the document is generated |
| %%Volume%% | The total volume of all the parts in the active scene using the current unit size |
| %%VolumeMM%% | The total volume of all the parts in the active scene in cubic mm |
| %%VolumeInch%% | The total volume of all the parts in the active scene in cubic inch |
| %%SupportVolume%% | The total volume of the support of all parts in the active scene using the current unit size |
| %%VolumeMM%% | The total volume of the supports of all the parts in the active scene in cubic mm |
| %%VolumeInch%% | The total volume of the supports of all the parts in the active scene in cubic inch |
| %%SurfaceArea%% | The total surface of all the parts in the active scene using the current unit size |
| %%SurfaceAreaMM%% | The total surface of all the parts in the active scene in square mm |
| %%SurfaceAreaInch%% | The total surface of all the parts in the active scene in square inch |
| %%DimX%% | The X-dimension of the bounding box around all loaded STL-parts in the active scene in the current unit size |
| %%DimY%% | The Y-dimension of the bounding box around all loaded STL-parts in the active scene in the current unit size |
| %%DimZ%% | The Z-dimension of the bounding box around all loaded STL-parts in the active scene in the current unit size |
| %%MaxZ%% | Maximum height of the build |
| %%DimXmm%% | The X-dimension of the bounding box around all loaded STL-parts in the active scene in mm |
| %%DimYmm%% | The Y-dimension of the bounding box around all loaded STL-parts in the active scene in mm |
| %%DimZmm%% | The Z-dimension of the bounding box around all loaded STL-parts in the active scene in mm |
| %%DimXInch%% | The X-dimension of the bounding box around all loaded STL-parts in the active scene in inch |
| %%DimYInch%% | The Y-dimension of the bounding box around all loaded STL-parts in the active scene in inch |

| | |
|---|---|
| %%DimZInch%% | The Z-dimension of the bounding box around all loaded STL-parts in the active scene in inch |
| %%NumOfBadEdges%% | Total amount of bad edges of the loaded parts in the active scene |
| %%NumOfBadContours%% | Total amount of bad contours of the loaded parts in the active scene |
| %%NumOfShells%% | The total number of shells in the active scene |
| %%Machinename%% | The name of the selected machine in the active scene |
| %%Materialname%% | The material name of the selected machine in the active scene |
| %%Comments%% | The comments concerning that machine in the active scene |
| STL View | Insert a JPEG |
| %%ScanTimeEstimation%% | The estimated scan time in the active scene |
| %%RecoatTimeEstimation%% | The estimated recoat time in the active scene |
| %%BuildTimeEstimation%% | Estimation of build time of the loaded parts (only used in the RP-version) in the active scene |
| %%CostEstimation%% | Estimation of cost of the loaded parts (only used in the RP-version) in the active scene |
| %%CostEstimationBuildtime%% | The cost fragment depending of the build time |
| %%CostEstimationFixed%% | The cost fragment depending of the fixed time |
| %%CostEstimationVolume%% | The cost fragment depending of the volume |
| %%CostEstimationSupportVolume%% | The cost fragment depending of the support volume |
| %%CostEstimationSurface%% | The cost fragment depending of the surface |
| %%CostEstimationDeltaX%% | The cost fragment depending of the delta X value |
| %%CostEstimationDeltaY%% | The cost fragment depending of the delta Y value |
| %%CostEstimationDeltaZ%% | The cost fragment depending of the delta Z value |
| %%CostEstimationNumberOfSTL%% | The cost fragment depending of the number of STLs |
| %%CostEstimationBoundingBoxVol%% | The cost fragment depending of the bounding box volume |
| %%UserDef:"Remark"%% | While generating the document, a dialog box will pop up for user input |

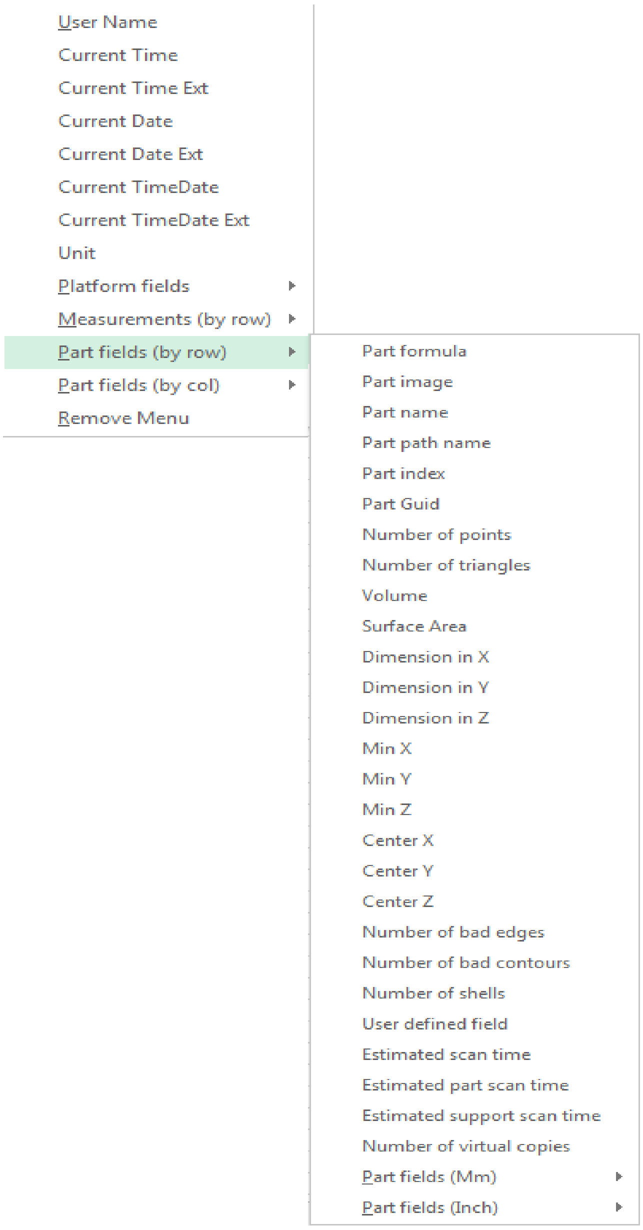
### 2.5.2.1.2.3.3 *Measurement fields*




These tags serve to make measuring reports. The Labels for the measuring report are made with the “Report” button in the measuring functionality. Use these tags in a label or in a loop.

| *Tag* | *Description* |
|---|---|
| %%Measlabel%% | The label that is given to measurement by Magics by pressing the “report” button. |
| %%MeasNominalValue%% | The value of the Measurement |
| %%MeasType%% | The type of measurement: a distance, radius or angle. |

### 2.5.2.1.2.3.4 STL fields




These tags will be replaced with the information of one single part. In cases where multiple parts are loaded, this information will be repeated once for each part. To achieve this, the tags must be placed into a table or a loop. Magics will repeat this information in the table for each part. See below how to make a loop.

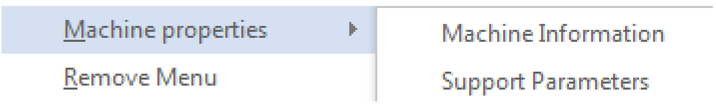
| *Tag* | *Description* |
|---|---|
| %%StlName%% | The separate name of the STL-part |
| %%StlFullName%% | The separate name of the STL-part + path |
| %%StlGuid%% | The GUID identifies the STL-part |
| %%StlIndex%% | An index number will appear in this column |

| | |
|---|---|
| %%NumOfCopies%% | The number of virtual copier of an STL part in the active scene |
| %%StlNumOfPoints%% | The amount of points of the STL-part |
| %%StlNumOfTriangles%% | The amount of triangles of the STL-part |
| %%StlVolume%% | The volume of the part using the current unit size |
| %%StlVolumeMM%% | The volume of the part in cubic mm |
| %%StlVolumeInch%% | The volume of the part in cubic mm |
| %%StlSurfaceArea%% | The surface of the part using the current unit size |
| %%StlSurfaceAreaMM%% | The surface of the part using square mm |
| %%StlSurfaceAreaInch%% | The surface of the part using square mm |
| %%StlDimX%% | The X-dimension of the bounding box in the current unit size in the active scene |
| %%StlDimY%% | The Y-dimension of the bounding box in the current unit size in the active scene |
| %%StlDimZ%% | The Z-dimension of the bounding box in the current unit size in the active scene |
| %%StlDimXmm%% | The X-dimension of the bounding box in mm in the active scene |
| %%StlDimYmm%% | The Y-dimension of the bounding box in mm in the active scene |
| %%StlDimZmm%% | The Z-dimension of the bounding box in mm in the active scene |
| %%StlDimXInch%% | The X-dimension of the bounding box in inch in the active scene |
| %%StlDimYInch%% | The Y-dimension of the bounding box in inch in the active scene |
| %%StlDimZInch%% | The Z-dimension of the bounding box in inch in the active scene |
| %%StlMinPosX%% | The minimal X value of the bounding of the parts in the active scene in the current unit size |
| %%StlMinPosY%% | The minimal Y value of the bounding of the parts in the active scene in the current unit size |
| %%StlMinPosZ%% | The minimal Z value of the bounding of the parts in the active scene in the current unit size |
| %%StlMinPosXmm%% | The minimal X value of the bounding of the parts in the active scene in mm |
| %%StlMinPosYmm%% | The minimal Y value of the bounding of the parts in the active scene in mm |
| %% StlMinPosZmm%% | The minimal Z value of the bounding of the parts in the active scene in mm |
| %%StlMinPosXInch%% | The minimal X value of the bounding of the parts in the active scene in Inch |
| %%StlMinPosYInch%% | The minimal Y value of the bounding of the parts in the active scene in Inch |
| %%StlMinPosZInch%% | The minimal Z value of the bounding of the parts in the active scene in Inch |

| | |
|---|---|
| %%StlCenterPosX%% | The X value of the center point of the parts in the active scene in the current unit size |
| %%StlCenterPosY%% | The Y value of the center point of the parts in the active scene in the current unit size |
| %%StlCenterPosZ%% | The Z value of the center point of the parts in the active scene in the current unit size |
| %%StlCenterPosXmm%% | The X value of the center point of the parts in the active scene in mm |
| %%StlCenterPosYmm%% | The Y value of the center point of the parts in the active scene in mm |
| %%StlCenterPosZmm%% | The Z value of the center point of the parts in the active scene in mm |
| %%StlCenterPosXInch%% | The X value of the center point of the parts in the active scene in Inch |
| %%StlCenterPosYInch%% | The Y value of the center point of the parts in the active scene in Inch |
| %%StlCenterPosZInch%% | The Z value of the center point of the parts in the active scene in Inch |
| %%StlNumOfBadEdges%% | The amount of bad edges of the part |
| %%StlNumOfBadContours%% | The amount of bad contours of the part |
| %%StlNumOfShells%% | The amount of shells |
| %%StlSupportScanTimeEstimation%% | The estimated scan time of the supports of the part |
| %%StlPartScanTimeEstimation%% | The estimated scantime of the part |
| %%StlScanTimeEstimation%% | The total scantime of the part |
| %%StlUserDef:"Remark"%% | While generating the document, a dialog box will pop up for user input for each STL-file |

*Remark*: for excel templates the 'STL view' tag is available for row and columns.

### 2.5.2.1.2.3.5 Machine properties fields




| *Tag* | *Description* |
|---|---|
| %%MachinePlatZComp%% | The platform settings and Z-compensation settings from the machine properties |
| %%MachineSupport%% | The support parameter settings from the machine |

#### 2.5.2.1.2.3.6 *Object fields*

Specific tags for documenting Objet set-ups.

#### 2.5.2.1.2.3.7 *RapidFit fields*

Specific tags for documenting RapidFit set-ups are documented in the RapidFit section of the manual.

#### 2.5.2.1.2.3.8 *Loops*

Instead of using tables for STL-fields, Measurements and EDM's, you can use loops. All the text and tags between the loop-tags %%For Each: MEASUREMENT%% and %%Next:MEASUREMENT%% will be repeated for each (in this example) measurement. This allows E.g. a complete page per part.

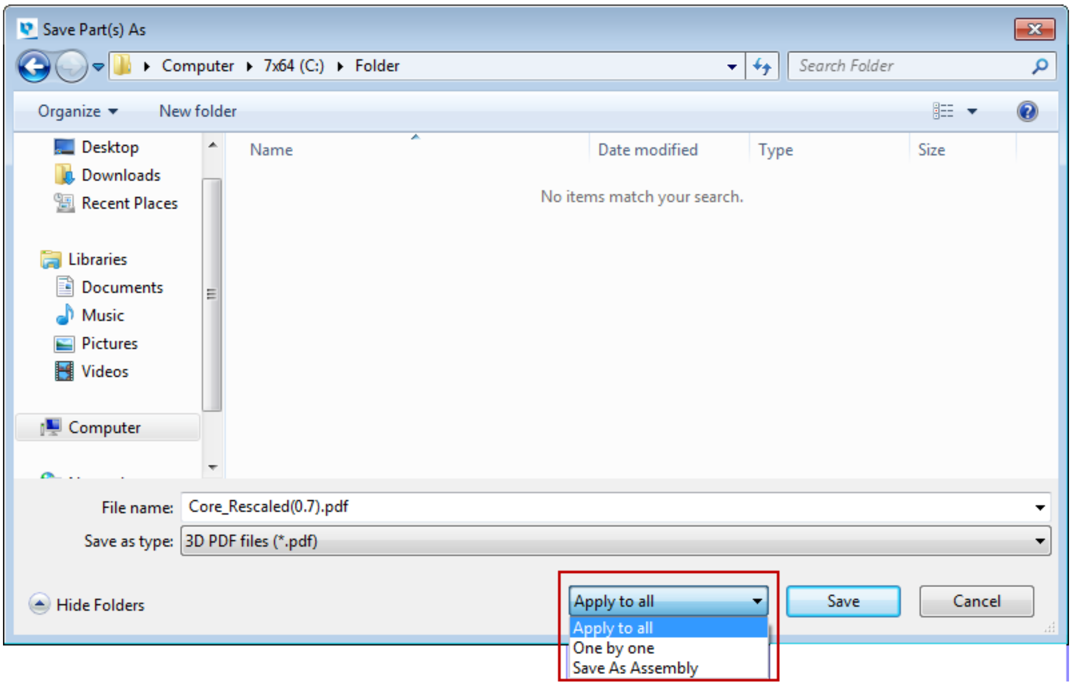
### 2.5.3 Save Part(s) As 3D PDF

By saving parts as 3D PDF, you create a PDF-file which can be viewed in 3D with a default Adobe Acrobat Reader. This enables you to send or view the design in 3D without specific software needed.

The user can save the parts by clicking on 'Save Part(s) as 3Dpdf' in the report ribbon. Alternatively the user can click 'Save Selected Parts As' in the toolbar and then select the '3D PDF (*.pdf)' file type.

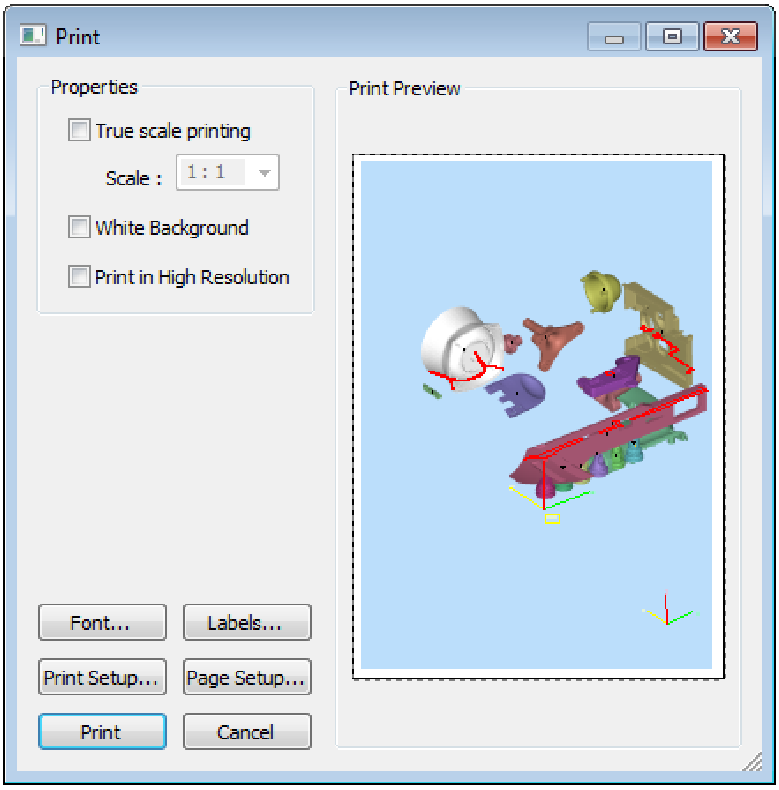
If the drop down menu is set to 'Apply to all', all parts will be saved individually under their respective names. If it is set to 'One by one', the user can change the file name of every part, with all the parts still being saved individually. Setting it to 'Save As Assembly' will save all the parts in one file, which can be viewed by the Adobe Acrobat Reader as an assembly or a collection of parts.

If there's support connected to the part, it will also be visible in the reader. When viewing the part, it's possible to hide the support by going to the Model Tree tab and unchecking the box in front of 'Support [filename]' or right clicking it and clicking 'Hide'. The same can be done with the part, to only show the support.



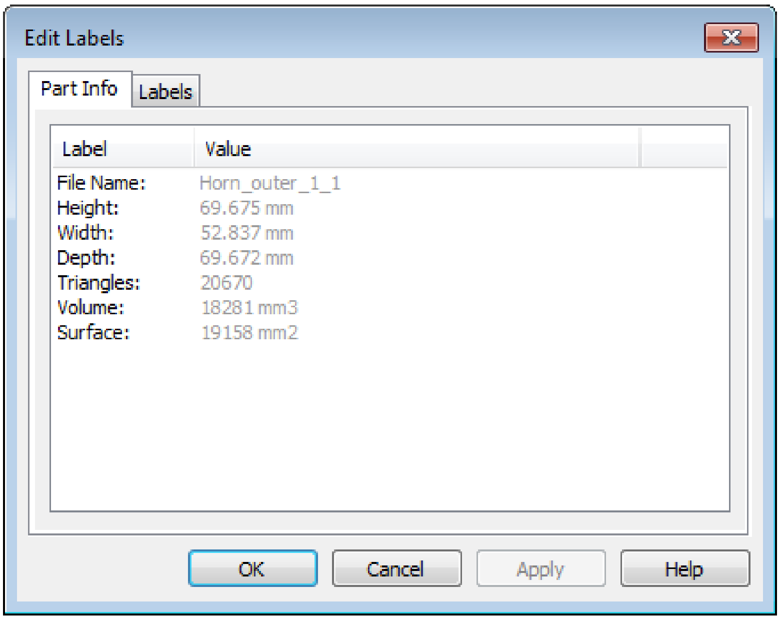

## 2.5.4 Print

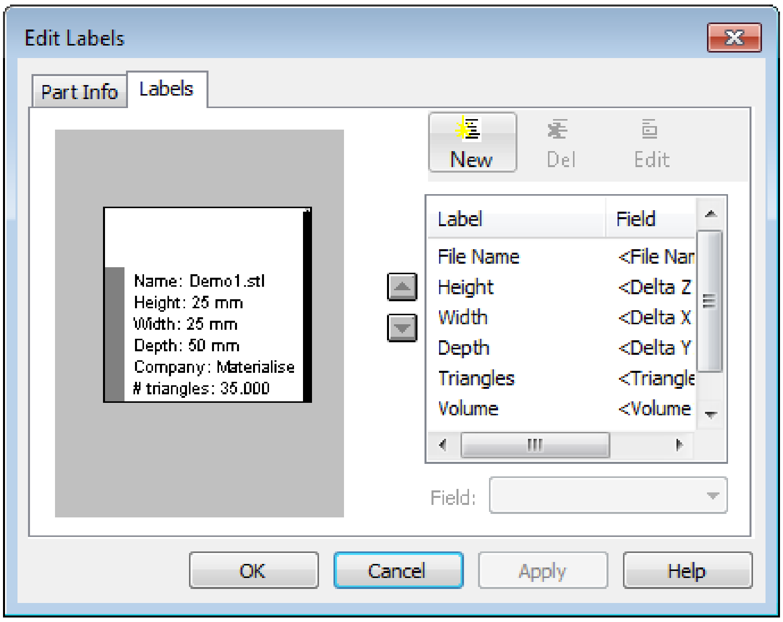
This command starts the Magics print wizard that leads you to the Page Setup and the standard Windows Print dialog box.



| | |
|---|---|
| Print Preview | The Print Preview is visible in the Print-action. The right half of the print dialog box is the Print preview. |
| True Scale Printing | This feature allows you to print in scale. This means that you can measure on the printed page.<br>*Remark:* Be aware of the fact that perspective views never allow measuring. |
| Font… | This allows you to define the font of the labels. |
| Labels… | Specify the information about the part that should be printed.<br>For instance: File name, Height, Width, Depth, Number of triangles…. |
| Print Setup… | The user can choose another printer, paper size and paper orientation using the standard printer setup interface. |
| Page Setup… | With Page Setup, one can define a print *style*. It is a standard Windows dialog box. |

### *2.5.4.1 Edit Labels*






### *2.5.4.2 Part Info*

This can be used to see information about the part, but it is also the information that will appear on paper when a part is printed (only one part may be visible to show this information). This info is selected via the Label Sheet.

### *2.5.4.3 Labels*

| | |
|---|---|
| New | A New Label and Field are added at the bottom of the list. The user can immediately change the label and the field type. |
| Del | To delete a label and a field: Select the label, and press on the Delete button. |
| Edit | The user can edit a label by selecting one, and pressing the Edit button. |
| Rearrange Label | The order of the labels can be changed with the arrow buttons. Select a label, and use the arrow buttons to move it one place up, or one place down the list. |
| Field Types | Several Field Types are predefined. See the following tale. |
| Changing Field Types | Select a Label, and select another field type. |

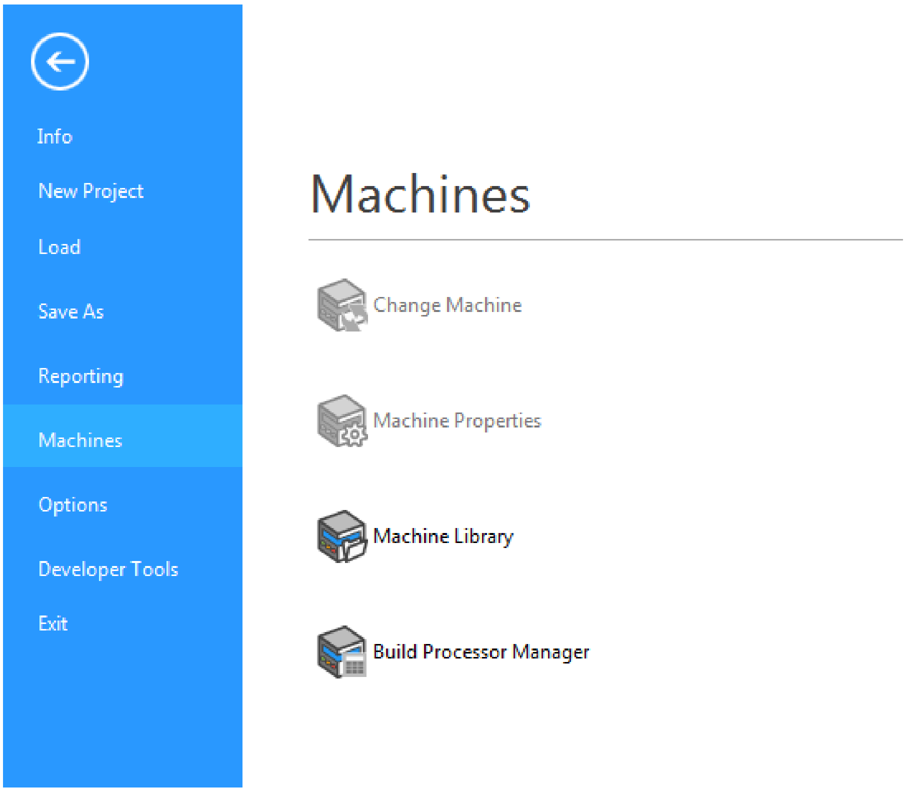
#### 2.5.4.3.1 Field Types

| *Label* | *Comment* |
|---|---|

| | |
|---|---|
| Delta X | Width of the STL part |
| Delta Y | Depth of the STL part |
| Delta Z | Height of the STL part |
| Dimensions | Start and end coordinates in all three dimensions |
| File Name | Name of the STL file |
| File Path | File Path of the STL file |
| Triangles | Number of triangles in the file |
| Volume | Volume of the STL part |
| Surface | Surface of the STL-part |

With the 'User Input' field, the user can input any string before printing (e.g. reference number, client name...). It is always possible to change to another field type.

## 2.6 Machines




### 2.6.1 Change Machine

— See Change Machine, page 258

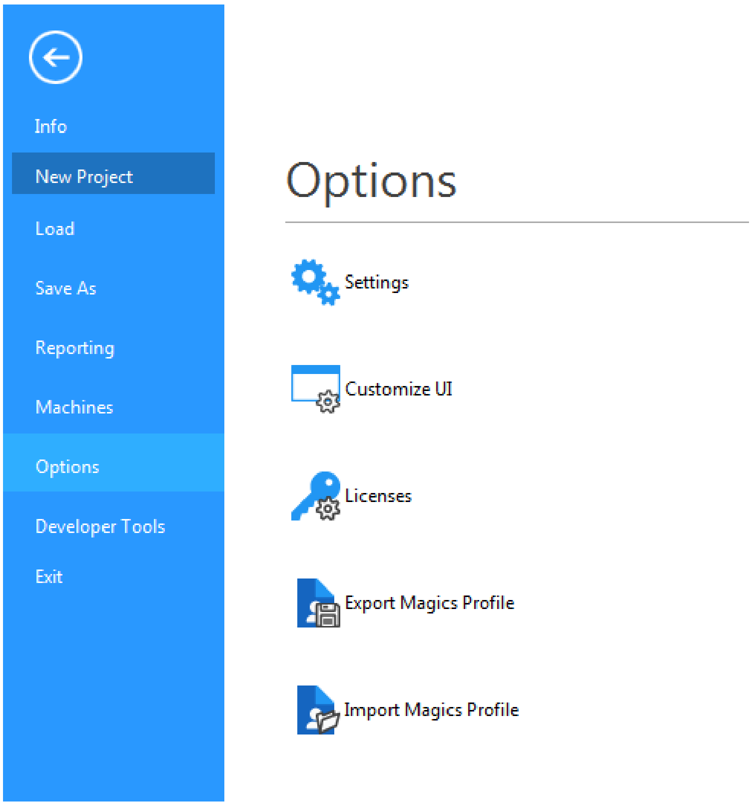
### 2.6.2 Machine Properties

— See Machine Properties, page 242

### 2.6.3 My Machines

— See My Machines, page 259

## 2.7 Options




### 2.7.1 Settings

— See Settings, page 314

### 2.7.2 Customize UI

— See Chapter 15: Customizations, page 387

### 2.7.3 Licences

- For details, please go to: https://help.materialise.com/

### 2.7.4 Export Magics Profile

- See Export Magics Profile, page 369

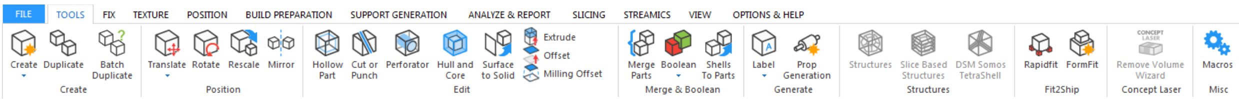
### 2.7.5 Import Magics Profile

- See Import Magics Profile, page 367

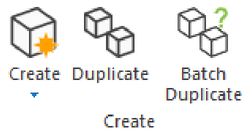
### 2.7.6 Exit

Closes Magics.

# 3 Chapter 3: Tools

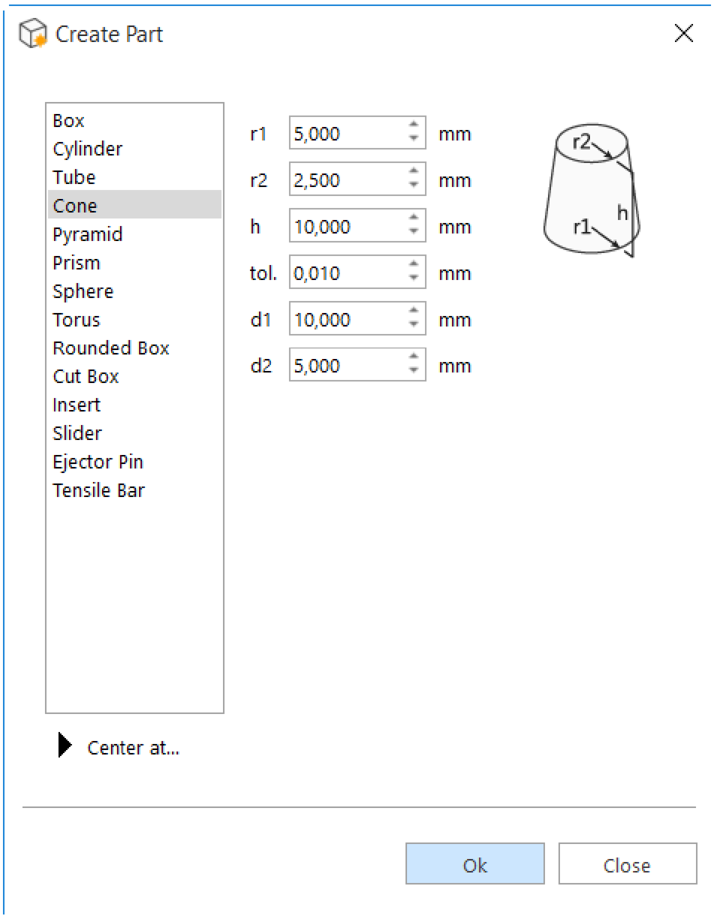



## 3.1 Create




### 3.1.1 Create


With this command, basic shapes can be created (STL files).

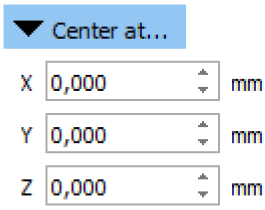


A window with two panes will be opened. The first pane contains a list with the volumes the user can choose. The second pane contains the object definition for the specified volume. A third pane, accessed by clicking “Center at…” enables to enter position coordinates.

### 3.1.1.1 Object Definition

The object definition-sheet contains all the parameters to define the object that the user would like to create. The parameters correspond with certain dimensions that are illustrated on the drawings. The tolerance parameter influences the number of triangles that will be created. Standard values appear every time this dialog box is opened. The first time, the default values are displayed. When you change these values and execute the operation, the used values will be remembered.

### 3.1.1.2 Center at

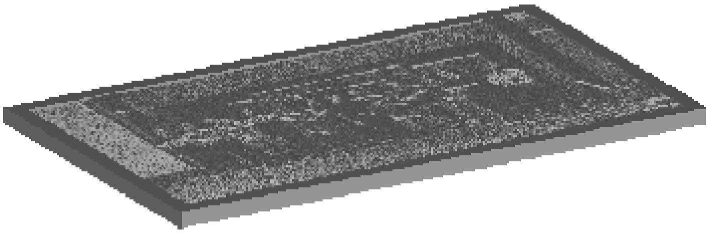


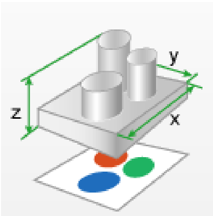

Here you can enter the coordinates of the center of the created part.

### 3.1.1.3 Create from Image

This function will create an STL-file of a kind of 3D-picture from a given image. Example:

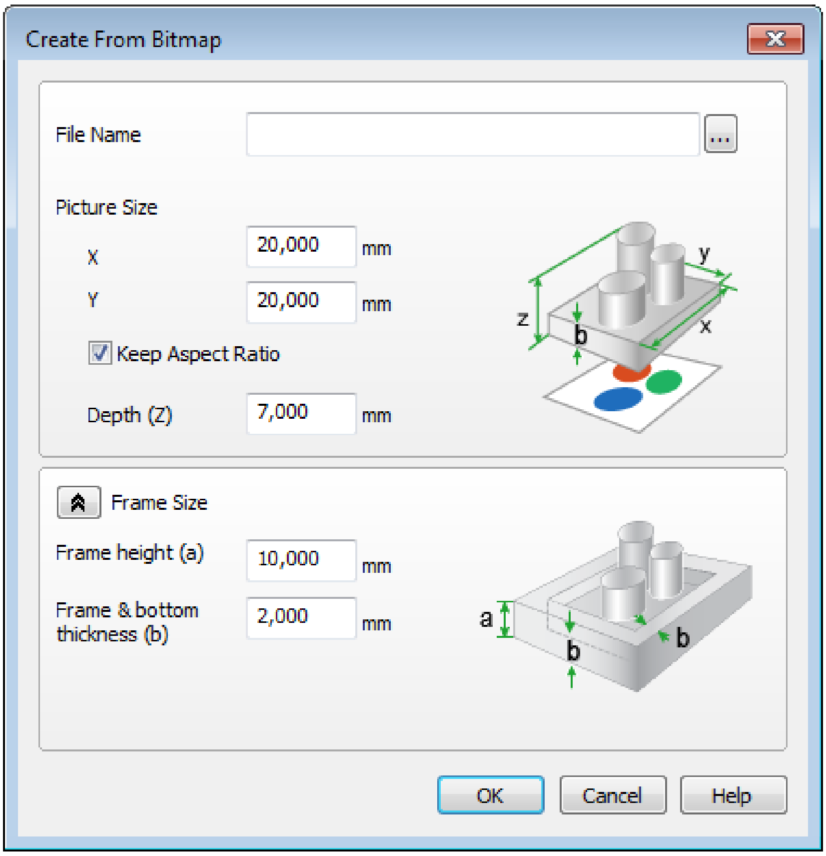
Above you see an image and below you see the created STL-file.






Nothing special, the only thing you can notice if you really look close is that the dark parts on the image are thick and the light areas are thin. But if you keep it in front of a light source with the relief pointing to you, you will see this.

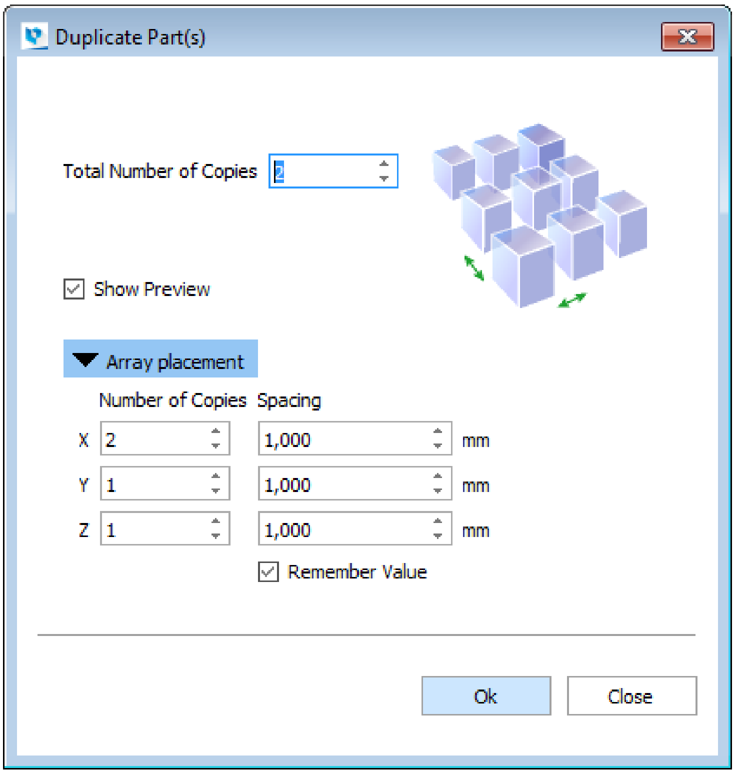
Because of the relief, the picture will be visible. This part was made with a ThermoJet (a kind of 3D-wax printer from 3D systems) but of course other techniques will also give nice results. As long as the material lets light through but is not too clear, the result should be fine.




| | |
|---|---|
| File Name | Source image from which you would like to make an STL-file. An image with a lot of contrast is advised. |
| Picture size: X & Y | The size of the picture inside the frame. |
| Keep aspect ratio | The aspect ratio expresses the proportion between the X and Y direction. |
| Depth | The relief is based on the gray values of the pixels of the bitmap. If a pixel is white, the thickness of the part will be minimal at that place, so a maximum of light will get through. If a pixel is black, the thickness is maximal and so a maximum of light will be blocked and so it will seem darker. Depending of the material, this value must be adapted. Some small experiments can be useful. |
| Frame height & Frame & bottom thickness | The size of the borders around the picture. |

### 3.1.2 Duplicate

Duplicate This command duplicates the selected parts. The new parts automatically get the name of the original part with a counter at the end, like this: “PartName_1”

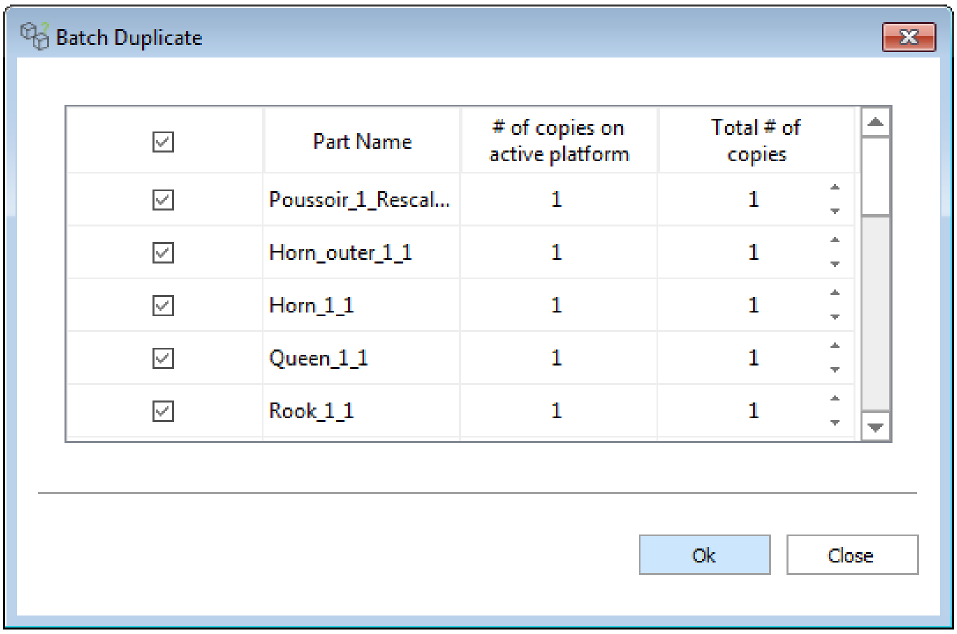



| | |
|---|---|
| Total Number of Copies | Here you have to indicate the total number of parts (the original part included) you would like to have in the end. |
| Show Preview | When enabled, a preview will be shown |
| Number of Copies | Number of copies (original included) you would like to have in the indicated directions (X, Y, Z) |
| Spacing & Remember Value checkbox | The distance between 2 parts. Check "*Remember Value*" if you want this value to be remembered. |

### 3.1.3 Batch Duplicate

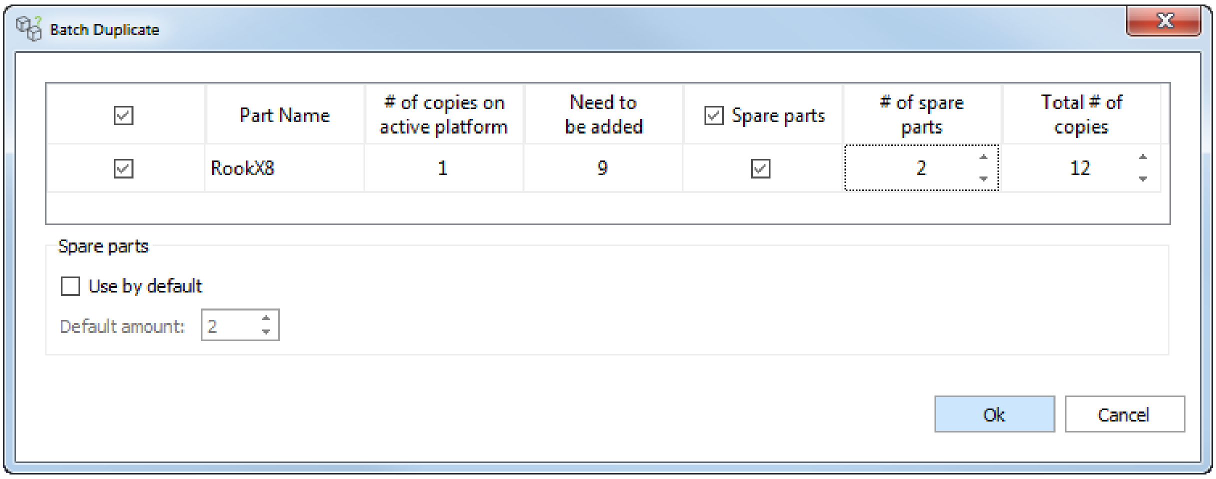
Batch Duplicate enables you to make a different amount of copies for multiple parts at the same time. It will help you save time by immediately placing the desired amount of duplicates of each part onto a platform.

When you have Streamics, Batch Duplicate will detect how many copies were ordered and immediately fill in the required number, taking into account already planned and built parts.




*Dialog without Streamics*

Open Batch Duplicate on the scene where you want to add copies. All the unique parts that are loaded in the Modeler Scene will be listed. Enable the checkbox of the parts you want to add. In “Total # of copies” you can input the desired number of copies. “# of copies on active platform” shows the amount of copies that are already present on the current scene. Press OK to make the copies. They will be placed through automatic placement.



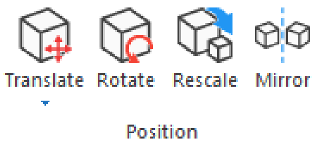

*Dialog with Streamics*

When using Batch Duplicate in combination with Streamics parts, a few extra columns will appear: “Need to be added” will show you how many parts still need to be planned, minus the ones already on the platform. This value takes into account parts that are already built, parts that are planned on a build, and parts on other platforms in the same Magics session. It does not take into account platforms saved in Streamics. The formula looks like this:

Need to be added = ordered amount - parts built - parts planned - parts on platforms

Other extra columns are “Spare parts” and “# of spare parts”. This allows you to easily add some extra copies for fragile parts that might break. If you do this often, it might be interesting to enable “Use by default” and insert a fitting default amount. Whenever you open this Batch Duplicate again, the spare parts fields will be filled in and enabled. You can always disable them and change the amount of spare parts.

## 3.2 Position




### 3.2.1 Translate

The translate operation allows to move a part or a group of selected parts to another position.

- See Translate, page 191

### 3.2.2 Rotate

The rotate operation allows to rotate a part or a group of selected parts.

- See Rotate, page 194

### 3.2.3 Rescale

A part can be rescaled with different factors in the three main directions.

- See Rescale, page 196

### 3.2.4 Mirror

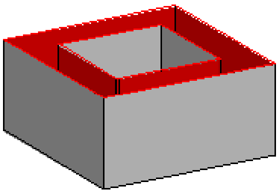
A part can be mirrored in different directions.

— See Mirror, page 200

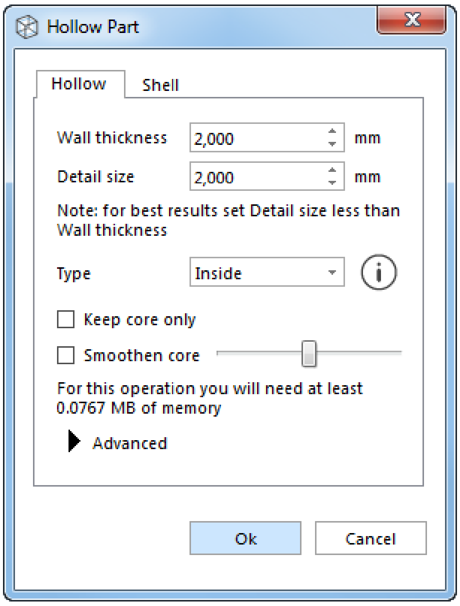
## 3.3 Edit


### 3.3.1 Hollow Part

You can use this command to easily remove material from a part; final printed parts will become lighter, saving you material and build time. The result of the hollow operation is one STL file that present a cavity with a constant wall thickness. This cavity is build from triangles whose size is determined by the parameter detail size. There is the option to keep the original part closed with all the faces (Hollow tab), or choose to remove selected faces (Shell tab).



### 3.3.1.1 Hollow

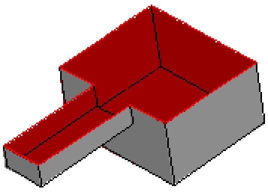



The result of the hollow operation is one STL file with two shells: the original shell and a new one that gives the part a constant thickness. You can select several parts and make them hollow in one operation.

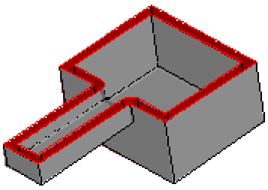
| | | |
|---|---|---|
| Wall Thickness | This value displays the distance over which the triangles of the original shell get an offset in order to generate a hollow part. | |
| Detail Size | This value displays the level of detail that will remain in the new shell. Standard, this value should be the same as the smallest detail of the part. The smaller this value, the more triangles will be included in the new shell and the more detail can thus be incorporated.<br>*Remark:* If the value is chosen too high, it is possible that the internal wall intersects with the external wall. | |
| Type | Here you determine if you want to create a new shell at the interior or at the exterior of the existing shell, or create a self-supporting structure. | |
| | Keep Core Only | If you only wish to retain the newly created shell, you can check this box.<br>*Note*: available for inside and outside values of Type parameter. |
| | Smoothen Core | By checking this option a smoothing will be performed on the created core.<br>(See Smoothing, page 178)<br>*Note*: available for inside and outside values of Type parameter. |
| | Surface angle | This value defines the self-supporting angle used to generate the internal cavity, making sure that no support is needed to build the part successfully. |

| | | |
|---|---|---|
| | | *Note*: available for self-support value of Type parameter. |
| Memory requirements | While you set the parameters, Magics makes an estimation of the quantity of free RAM that will be needed during the calculation and of the number of triangles that will be created. You'll need to enter new values in the Wall thickness and Detail size fields to see a new estimation of the amount of RAM and new triangles. The amount of triangles can later on be reduced with the Triangle Reduction function (see Advanced, page 95). The memory requirements depend greatly on the value set for Detail size. | |

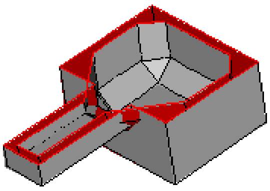
*Original*



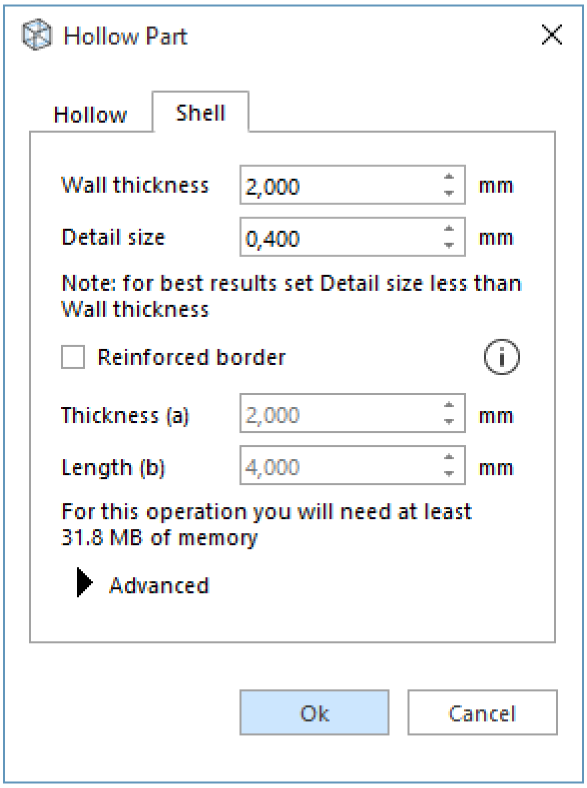
*Hollow: inside direction*



*Detail size value too big*



### 3.3.1.2 Shell

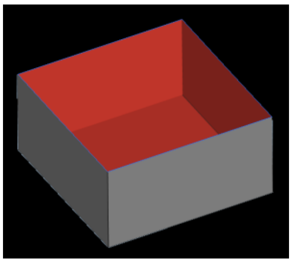



Mark the surfaces on the part that you would like to remove; the remaining part will be hollowed out. The result of the shell operation is normally one STL with one shell, but, depending on the marked surfaces and the part geometry, multiple shells can be created too.

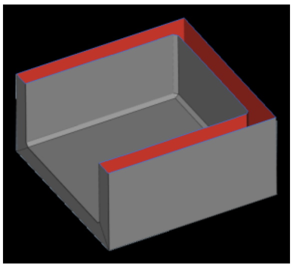
| | |
|---|---|
| Wall Thickness | This value displays the distance over which the triangles of the original shell get an offset in order to generate a hollow part. |
| Detail Size | This value displays the level of detail that will remain in the new shell. Standard, this value should be the same as the smallest detail of the part. The smaller this value, the more triangles will be included in the new shell and the more detail can thus be incorporated.<br>*Remark:* If the value is chosen too high, it is possible that the internal wall intersects with the external wall. |
| Reinforced border | You can generate an extra border on the open side of the part, to increase strength around the open area or to add stability to the part when the open side lies on the part base.<br>*Remark*: the reinforced border will follow the original shape of the marked surface that created the open side. |

| | | |
|---|---|---|
| | Thickness | You can assign a specific thickness to the border which can be different compared to the wall thickness. |
| | Length | This value determines the distance between the inner cavity and the end of the border. |
| Memory requirements | While you set the parameters, Magics makes an estimation of the quantity of free RAM that will be needed during the calculation and of the number of triangles that will be created. You'll need to enter new values in the Wall thickness and Detail size fields to see a new estimation of the amount of RAM and new triangles. The amount of triangles can later on be reduced with the Triangle Reduction function (see Advanced, page 95). The memory requirements depend greatly on the value set for Detail size. | |

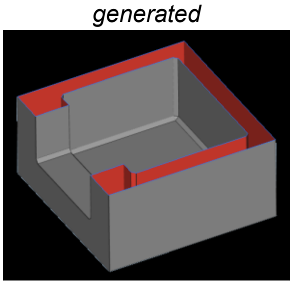
*Original*



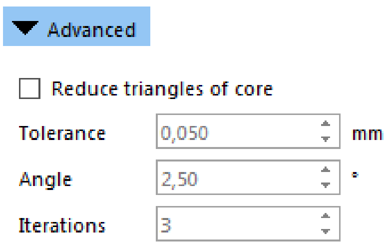
*Shell: one marked face removed*



*Reinforced border generated*



### 3.3.1.3 Advanced



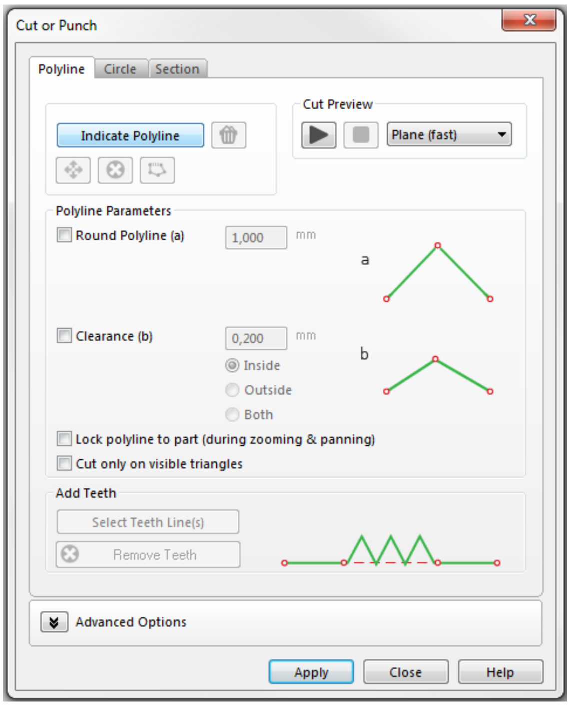

| | | |
|---|---|---|
| Reduce triangles of Core | Because the hollow function creates a lot of triangles, you have the possibility to reduce these at once. | |
| | Tolerance | These parameters are explained in more detail in Triangle Reduction function. See Triangle reduction, page 176 |
| | Angle | |
| | Number of Iterations | |

## 3.3.2 Cut or Punch

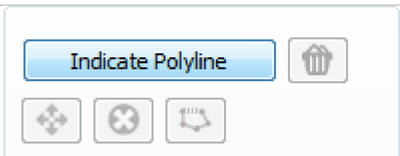

With this command you can cut parts and punch holes into STL-files. First a cutting line needs to be defined. Then the cut will take place along this cutting line, perpendicular on the screen. There are three different ways to define the cutting line.

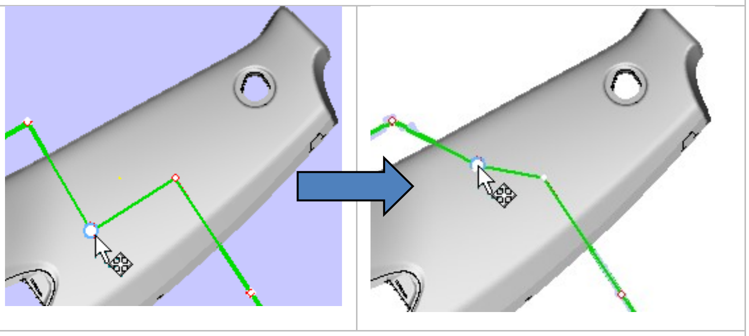
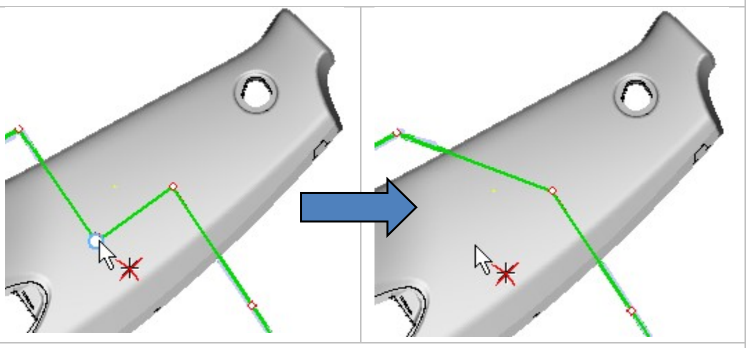
- Polyline
- Circle
- Section

### 3.3.2.1 *Polyline*



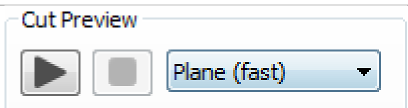

### 3.3.2.2 *Draw polyline*

| | |
|---|---|
| |  |
| Indicate polyline | Click here to start drawing the polyline by clicking on the screen. Each click will make a new point. Holding ALT while drawing the polyline will snap to 90° or 45° turns.. |
| Clear all points | All points will be removed |

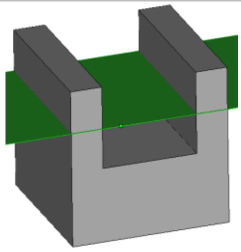
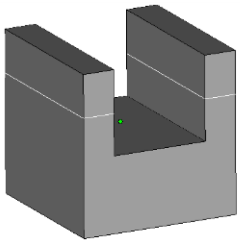
| | |
|---|---|
| Move point(s) | Modify your drawn polyline by selecting points and moving them to the required position |
| |  |
| Delete point(s) | Only the last specified point will be removed |
| |  |
| Close contour | If you have drawn a closed polyline you can click on close so the program knows this is the polyline you would like to use for the cut. If the polyline you have drawn is not closed, Magics will close it automatically via the outside of the part. |

### 3.3.2.3 *Cut preview*

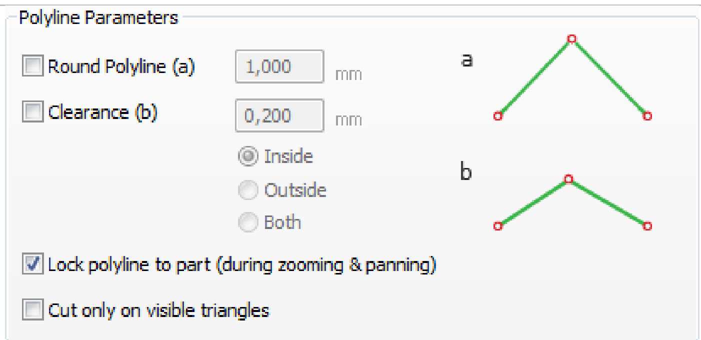
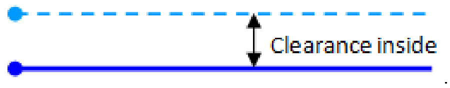
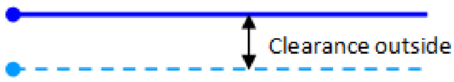
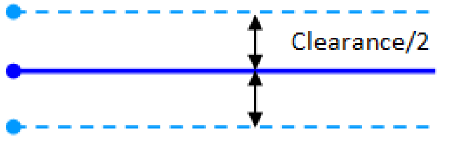
The cut preview gives you a first indication how the actual cut will be after applying. In this stage it is still possible to move your part according to the defined cutting line.

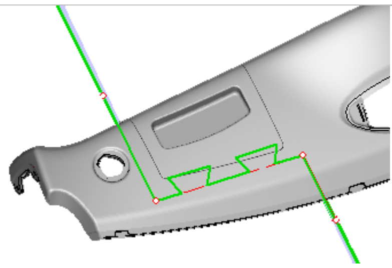
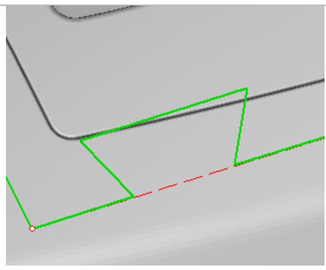



| | | |
|---|---|---|
| Play | Start the preview of the indicated polyline | |
| Stop | Stop the preview of the indicated polyline | |
| Preview type | Two different types of preview are available: | |
| | Plane (fast) | The polyline preview cut is represented by a plane. |

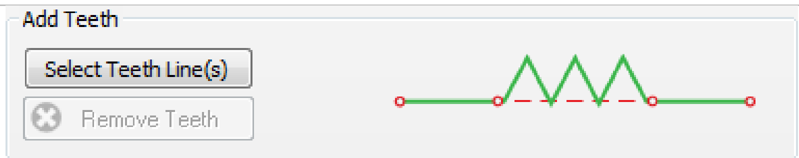
| | | |
|---|---|---|
| | |  |
| | Projection | The polyline preview cut is represented by a projection on the part where the actual cut will take place.<br> |

### 3.3.2.4 Polyline parameters

| | | |
|---|---|---|
|  | | |
| Round polyline | You can choose to round the corners of the polyline with the given radius | |
| Clearance | If checked, the intersecting line gets an offset towards the inner, other or both sides of the parts. This way you introduce a little gap between the parts that result from the cut. | |
| | Inside |  |
| | Outside |  |
| | Both |  |

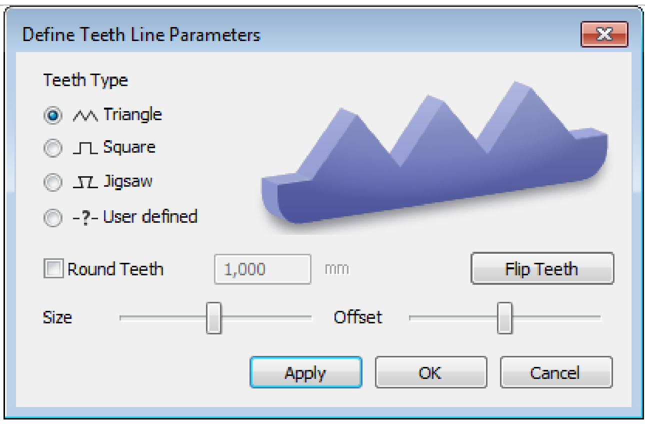
| | | |
|---|---|---|
| Lock polyline to part | The polyline is locked to your part while panning and zooming is used, this to easier define the required cutting line. | |
| Cut only on visible triangles | Hide some sections of the part with the multi-section view options and only perform your cut on the 'visible' triangles | |
| |  Polyline indication |  Polyline locked and zoom performed |

### 3.3.2.4.1 Add Teeth

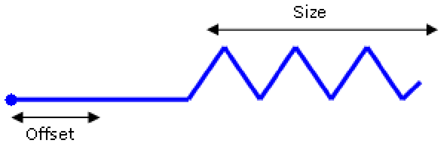
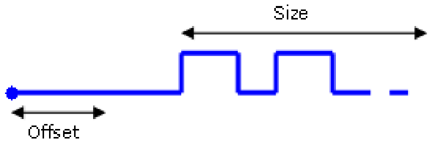
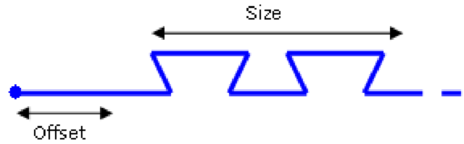
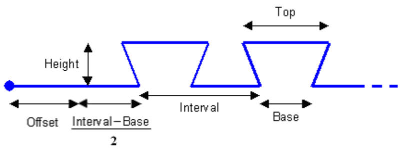



| | |
|---|---|
| Select teeth line(s) | Select part of the polyline to define required teeth.<br>Selections can be made in between two definied points. |
| Remove teeth | Remove previously definied teeth |

#### 3.3.2.4.1.1 Define teeth line parameters




| | |
|---|---|
| Teeth type | Different teeth type can be selected for every 'part' of the polyline. |

| | | | |
|---|---|---|---|
| | Triangle |  | |
| | Square |  | |
| | Jigsaw |  | |
| | User defined | Next to the predefined teeth type, the possibility of customizing teeth is available. | |
| | | Height |  |
| | | Base length | |
| | | Top length | |
| | | Interval | |
| | | Offset | |
| Round teeth | Sharp corners can break easily. Rounding of the corners will reduce this and allow a better fitting. | | |
| Flip teeth | Teeth are reinverted. | | |
| Size | By changing the size, more or less teeth are shown. | | |
| Offset | This is the distance between the wall of the part and the step in the cutting surface | | |

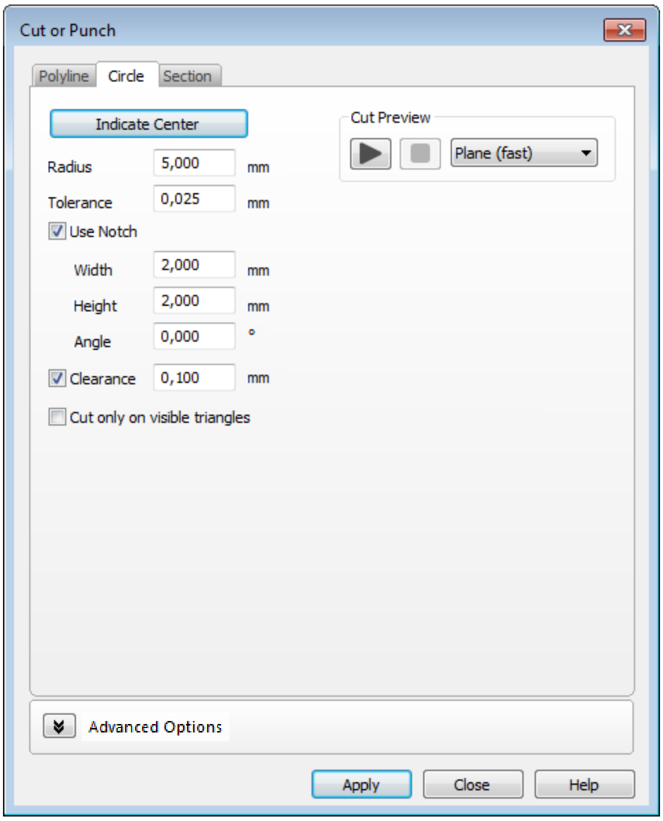
### 3.3.2.4.1.2 Advised way of working

- Draw a polyline by defining different points
- Press the ‘select teeth line(s)’ button to assign different types
- Select parts of the polyline where teeth need to be added
- Specify per part of the polyline which teeth type is required
- Press ‘Apply’ or ‘OK’ to apply the teeth on the polyline

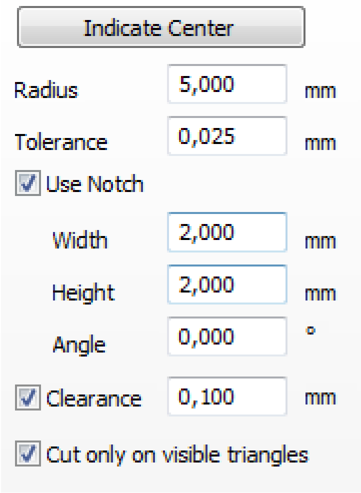
#### 3.3.2.4.2 Advanced Options

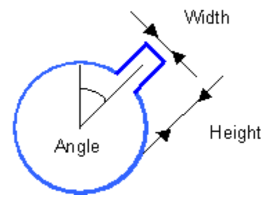

| | |
|---|---|
| Cut till Z | This will stop the incision at the plane defined by the given z-coordinate. This option only works in the top view. |
| Enter Coordinate | The polyline moves to the entered coordinates. |
| Show Coordinate | Shows the coordinates of the indicated points |

### *3.3.2.5 Circle Cut*



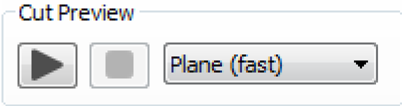
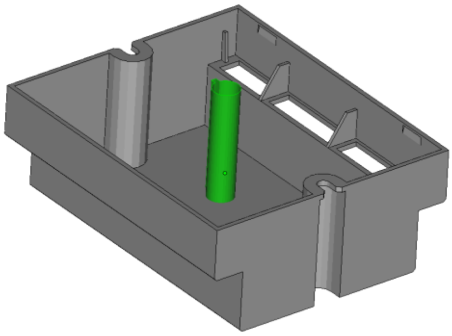
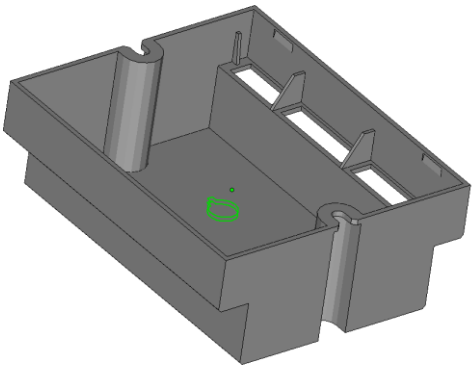
### 3.3.2.5.1 Draw circle



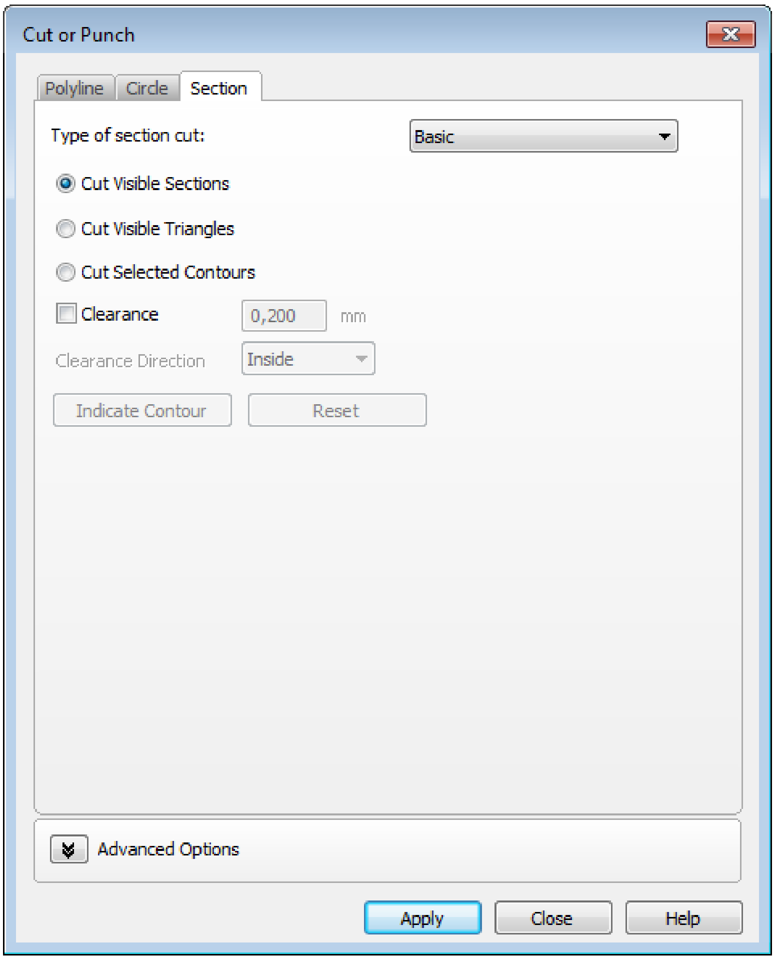

| | | |
|---|---|---|
| Indicate Center | You can indicate a point on the part. This point will be the center of the circle. | |
| Radius | Here you determine the radius of the circle, and thus the cylinder you will cut out of the loaded part. | |
| Tolerance | The tolerance value determines the deviation between the circle drawn by the program (a polygon) and a real circle. It is the distance along the radius perpendicular on and through the middle of one of the edges of the polygon between the cross point of the radius with the polygon and the cross point of the radius with the circle. The higher the tolerance, the bigger the deviation. | |
| Use Notch | You can choose to add a small notch. The notch is defined by the parameters Angle, Width and Height. | |
| | Width |  |
| | Height | |
| | Angle | |
| Clearance | If you check this box, the intersection line gets an offset towards the inner side. This way you introduce a little gap between the parts that result from the cut. | |
| Cut only on visible triangles | Hide some sections of the part with the multi-section view options and only perform your cut on the 'visible' triangles. | |

### 3.3.2.5.2 Cut preview

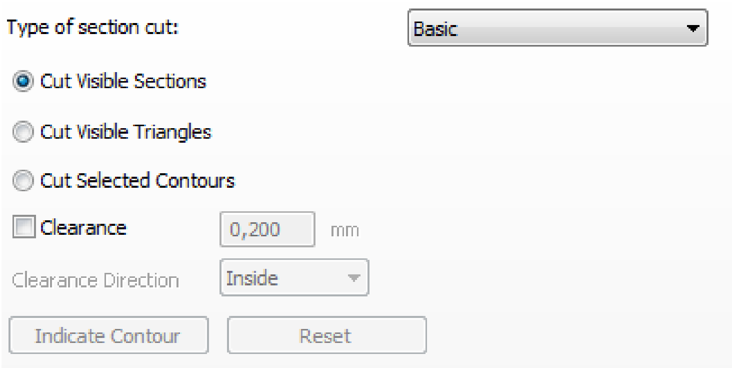
The cut preview gives you a first indication how the actual cut will be after applying. In this stage it is still possible to move your part according to the defined cutting line.

| | | |
|---|---|---|
|   | | |
| Play | Start the preview of the indicated polyline | |
| Stop | Stop the preview of the indicated polyline | |
| Preview type | Two different types of preview are available: | |
| | Plane (fast) | The polyline preview cut is represented by a plane.  |
| | Projection | The polyline preview cut is represented by a projection on the part where the actual cut will take place.  |

### 3.3.2.6 Section Cut



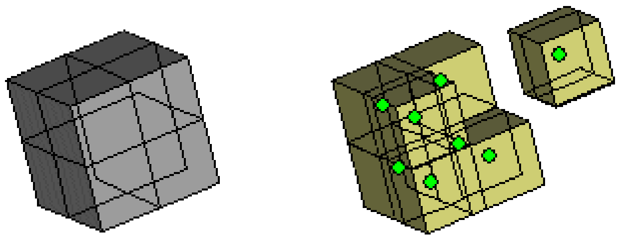

#### 3.3.2.6.1 Basic Section Cut

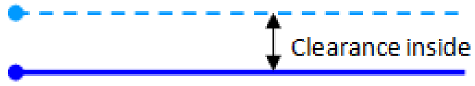
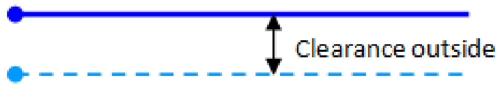
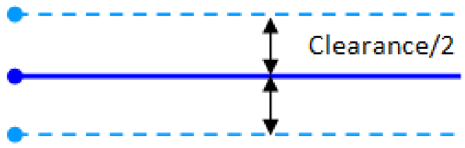


#### 3.3.2.6.1.1 Cut Visible Sections

If you define some sections, you can make a cut along all these sections. For more information about how to define sections, please see Sections.

In the figure below, an X, Y and Z section are defined. If you select 'Cut Visible Sections' this is what happens:

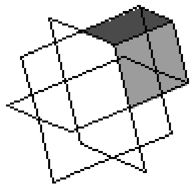


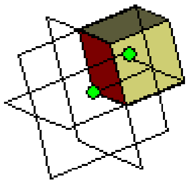
<table>
<tr><td rowspan="4">Total Clearance</td><td colspan="2">If you would like to have a little gap between the two parts that result from the cutting line, you can add a clearance. This either to the inside, outside or on both sides.</td></tr>
<tr><td>Inside</td><td>
</td></tr>
<tr><td>Outsid<br>e</td><td>
</td></tr>
<tr><td>Both sides</td><td>
</td></tr>
</table>

#### 3.3.2.6.1.2 Cut Visible Triangles

If you have defined a section (Sections), you can clip and flip to visualize only the part behind or before the section. With the Cut Visible Triangles function, you can cut out the visible part. It is possible to make different combinations of sections, with each their own clip or flip.

In the figure below, three sections are defined, and a clip is applied on each of them so only the part before the section is made visible. By selecting cut visible triangles, the visible part becomes a separate part.



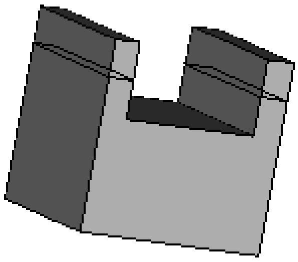


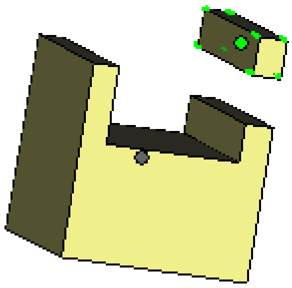
3.3.2.6.1.3 Cut Selected Contours

If you have defined a section, and you only would like to cut away some parts at one side of it, you can do so with the cut selected contours function. Select the contour (the intersection line between the part and the section) you would like to cut with the Indicate Contour button and press the Apply button.

In the figure below a Z section is made. The contour on the right is selected, so only the right 'leg' will be separated from the main part.

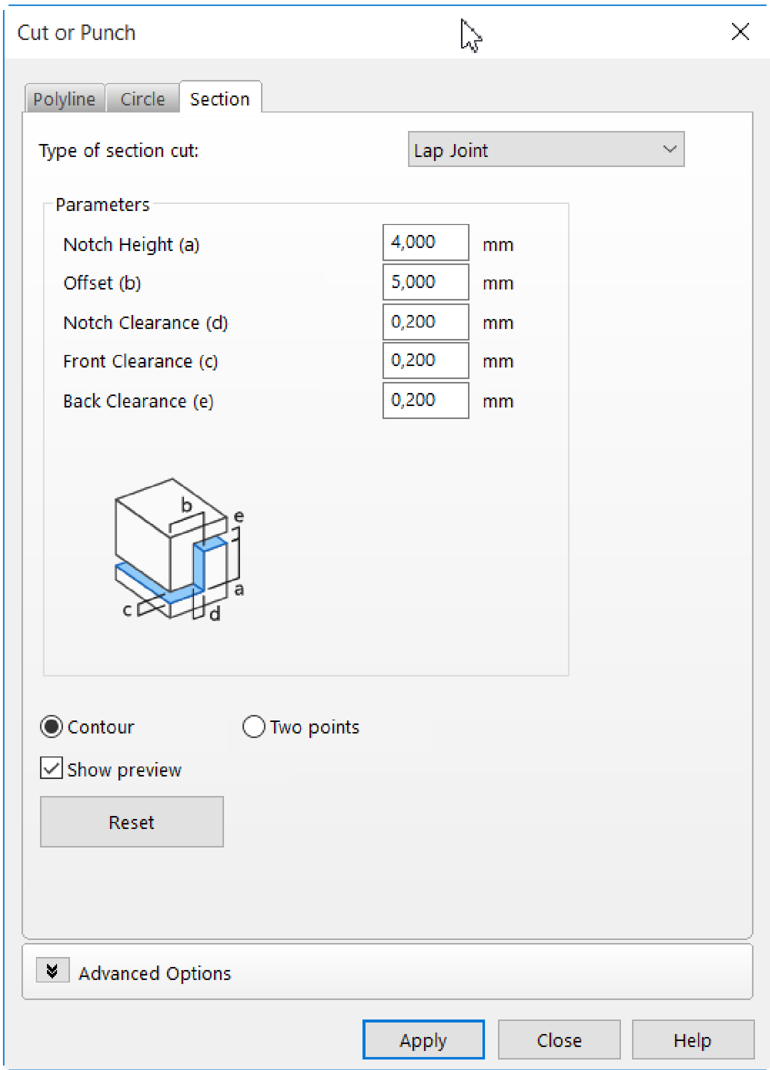
If you have indicated a section, and you would like to erase the indication, you can use the Reset button.





### 3.3.2.7 Lap Joint Cut

#### 3.3.2.7.1.1 Lap Joint cut on a closed contour

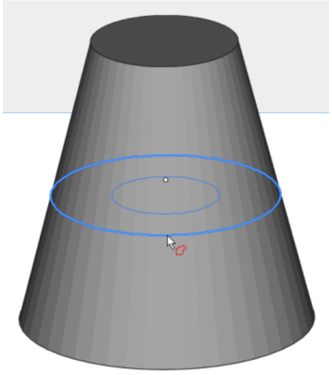
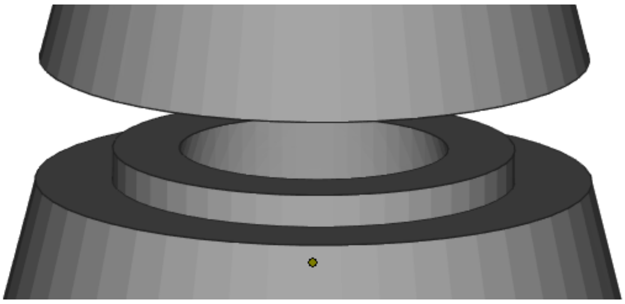
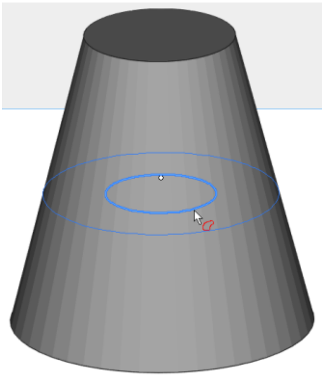
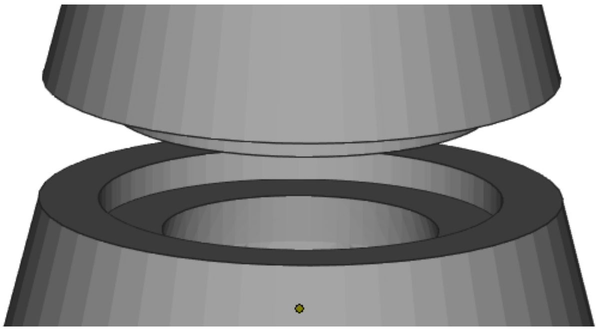
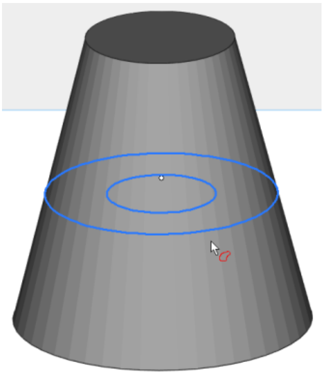
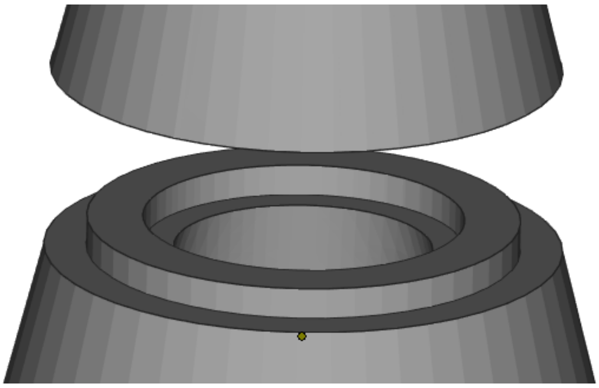



You can make a lap joint cut along a predefined section:

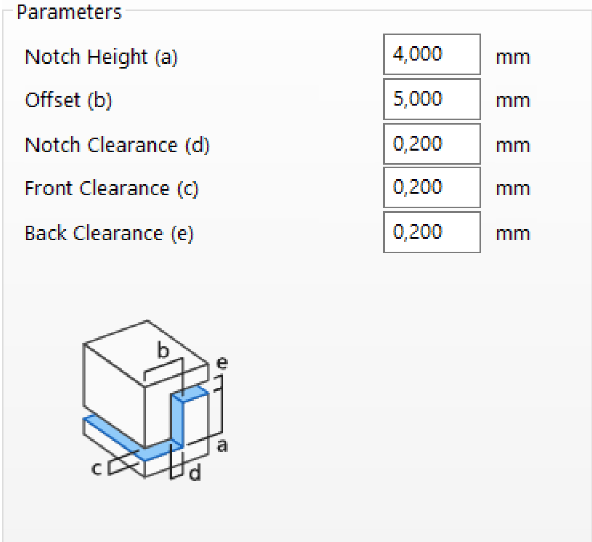
1. Select Multi-section preview on the part
2. With the mouse, click on the contour on which the cut will be applied
3. Set the parameters of the cut
4. Click on apply

This type of cut makes it possible to place printed parts back together. When the Contour radio button is selected, the following option is available:

| | |
|---|---|
| Contour | Select the contour (the intersection line between the part and the section) you would like to cut. |
| Reset | Erases the defined contour selection. |

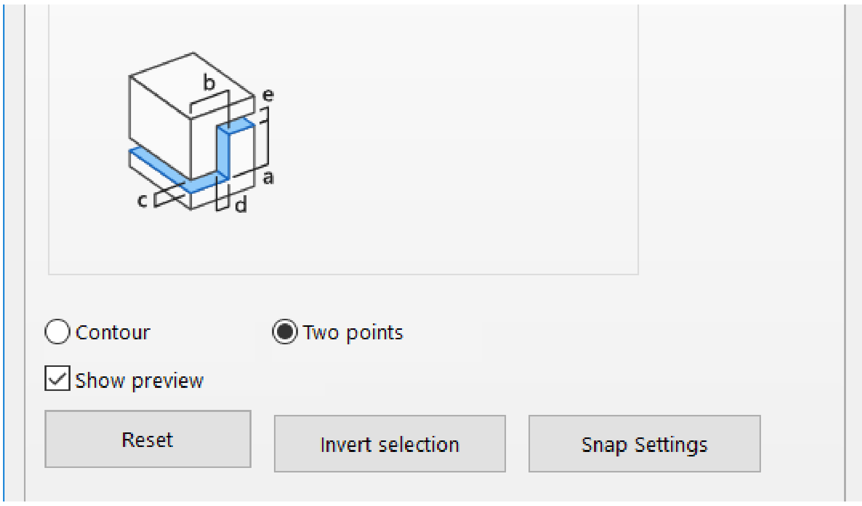
| | |
|---|---|
| Select outer contour and apply cut:  | Result:  |
| Select inner contour and apply cut  | Result:  |
| Select outer and inner contour and appply cut:  | Result:  |

By defining 4 parameters and using the available options, this cutting operation has a variety of alternatives.




| | |
|---|---|
| Notch Height | This parameter defines the z-coordinate of the incision (height between the top and bottom incision plane.) |
| Offset | This is the distance between the wall of the part and the step in the cutting surface.<br><br>*Remark:* The offset cannot be taken too big. It is also important that the part is uniform in the Z direction over the length of the step. Otherwise deformations will occur. |
| Notch Clearance | You can decide to make a little gap along the cut. This way the two parts can easily slide into each other if you have to assemble them. |
| Front Clearance | Clearance added in the direction perpendicular to the section. |
| Back clearance | Gap left at the back side of the cut |
| Show preview | Shows the cut before it is applied. |

#### 3.3.2.7.1.2 Lap joint cut between 2 points



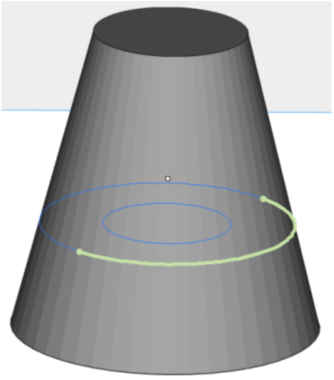
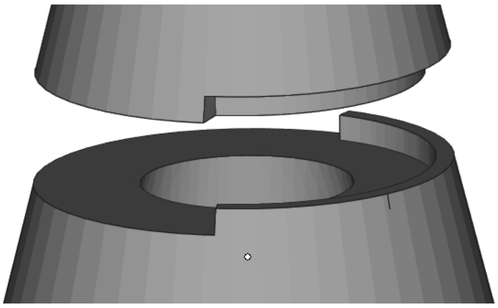
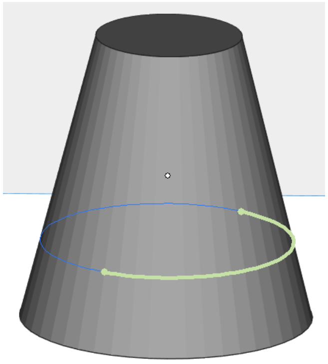
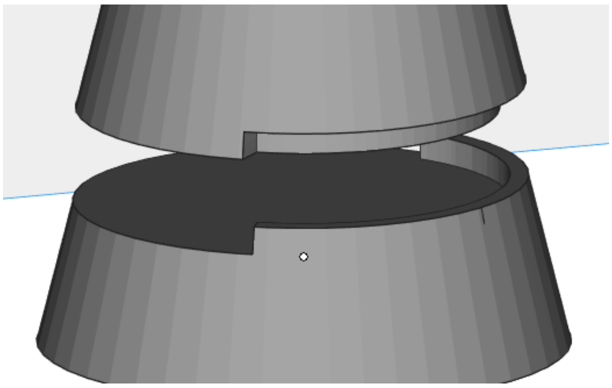
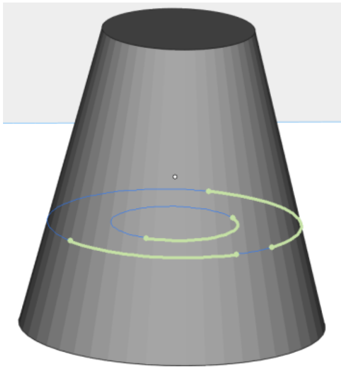
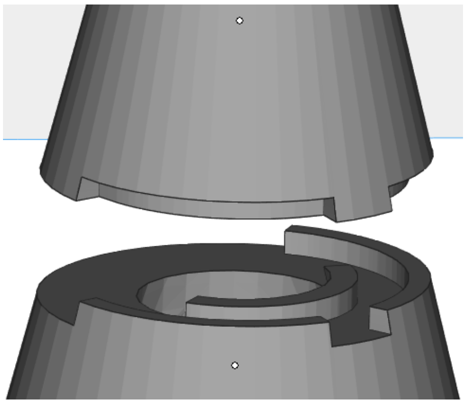

The Lap joint cut can be performed between two customizable points. In order to be able to make a cut between two selected points, the radio button *Two points* needs to be selected. The two points can be indicated only on a multisection contour.

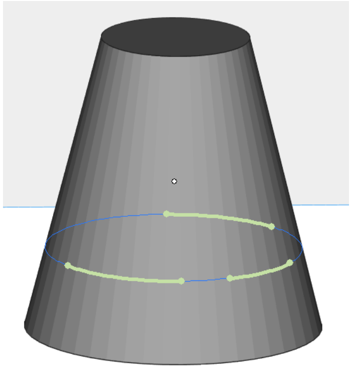
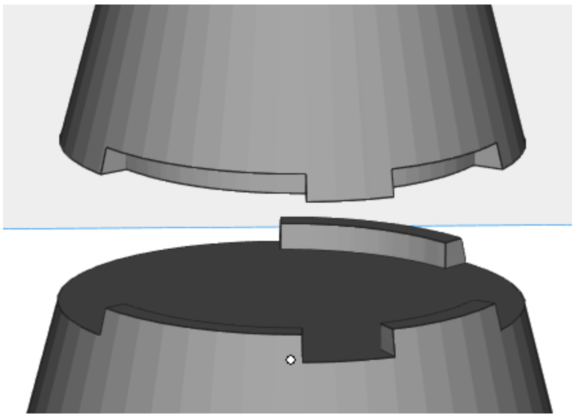
Once the points have been indicated on the contour, the shortest line between them will be marked as selected. The cut will be applied starting from this line.

The user can click Apply to perform the cut on the indicated part of the contour. Sometimes an Autofix operation needs to be applied on the part after the Cut operation.

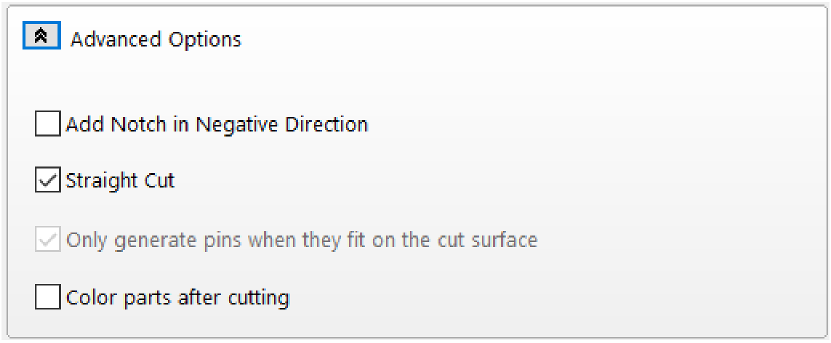
When the radio button *Two points* is selected, the following possibilities become available:

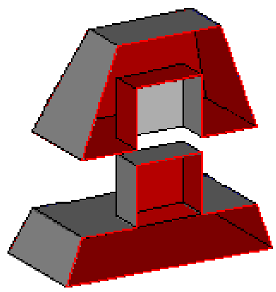
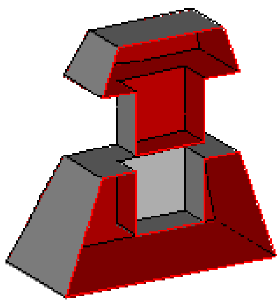
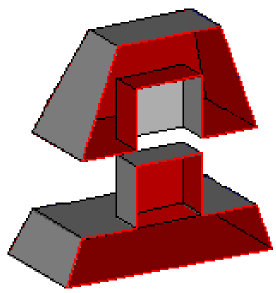
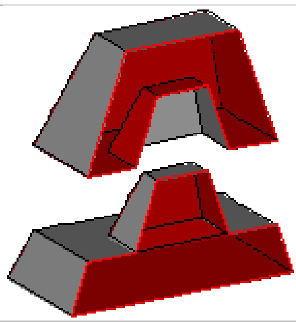
| | |
|---|---|
| Two points | Select the points between which the cut will be applied. Selection of multiple sets of 2 points is possible on any contour of a section. |
| Invert selection | Inverts the selection made between the 2 customizable. Invert selection is inactive is multiple sets of 2 points are selected on one section. |
| Snap settings | Opens the Settings for Selection and Snapping. |
| Reset | Resets the point selection |
| Show preview | Shows the cut before it is applied. |

| | |
|---|---|
| Select 2 points on a hollowed part and apply cut:  | Result:  |
| Select two points on a non-hollowed part and apply cut:  | Result:  |
| Select two points on a hollowed part and apply cut:  | Result:  |

| Select multiple areas on a non-hollowed part and apply cut: | Result: |
|---|---|
|  |  |

### 3.3.2.7.1.3 Advanced options

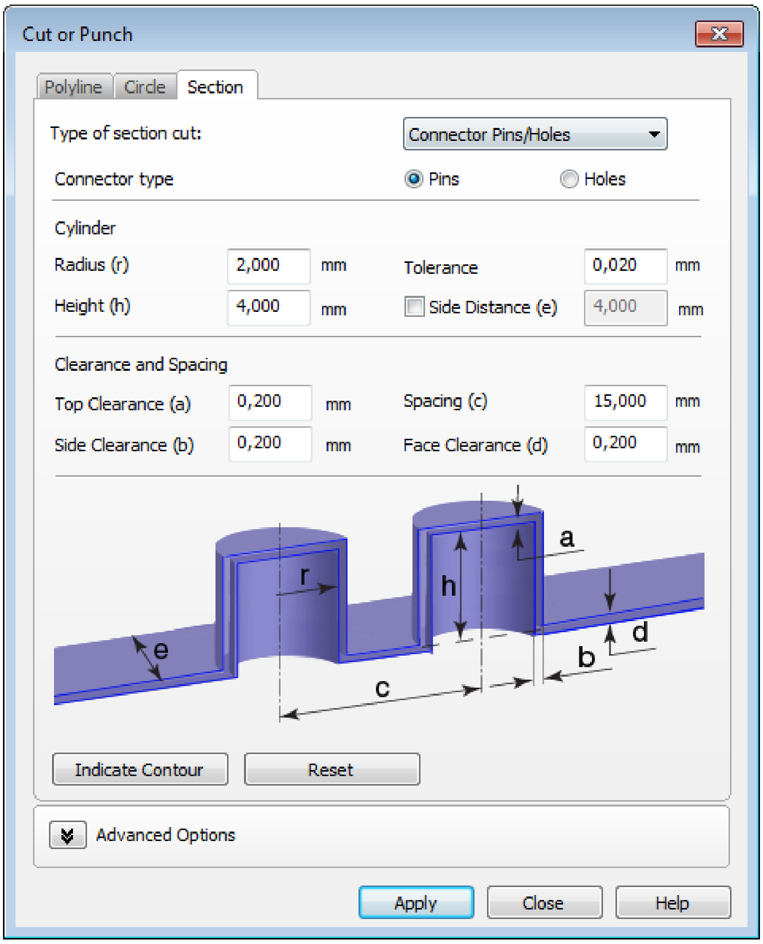



| | | |
|---|---|---|
| Add Notch in Negative Direction (Default OFF) |  |  |
| Straight Cut (Default ON) |  |  |

| | | |
|---|---|---|
| Color part after cutting | Assigns different colors to the pieces of the cut part. | |

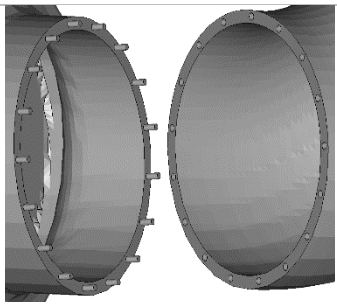
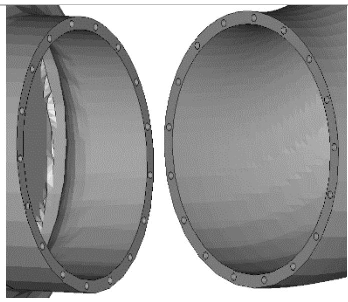
### 3.3.2.8 *Connector Pins/Holes Section Cut*

Parts with a complex geometry can be cut with connector pins. Instead of just making a straight cut, connector pins will be placed. This makes it possible to fit the parts back together once they are built.

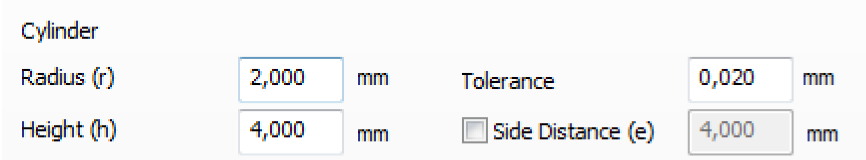


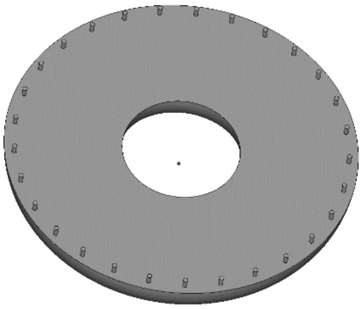
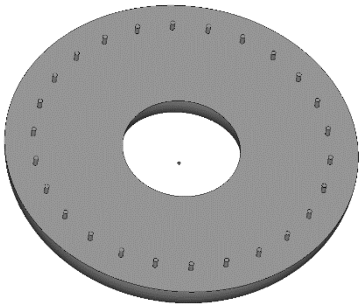

#### 3.3.2.8.1 Connector type


| | |
|---|---|
| Pins/Holes | Specify which type of connections has to be created.<br>— Pins on one site and holes on the other side |

| | | |
|---|---|---|
| | — OR<br>— Holes at 2 sides of the performed cut | |
| |  |  |

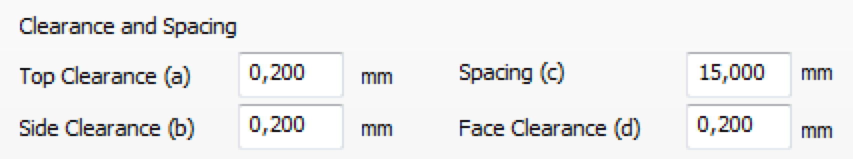
### 3.3.2.8.2 Cylinder

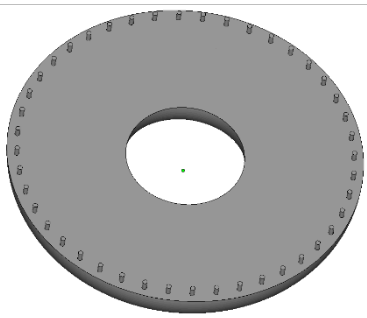
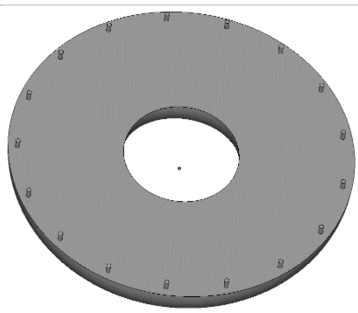



| | | |
|---|---|---|
| Radius | Here you determine the radius of the connector pin. | |
| Height | Here you determine the height of the connector pin. | |
| Tolerance | The tolerance parameter influences the number of triangles that will be created. | |
| Side distance | Indicates the distance, starting from the side of the part till where the cylinders will be placed. | |
| | <br>Side distance = 4 mm | <br>Side distance = 12 mm |

### 3.3.2.8.3 Clearance and Spacing

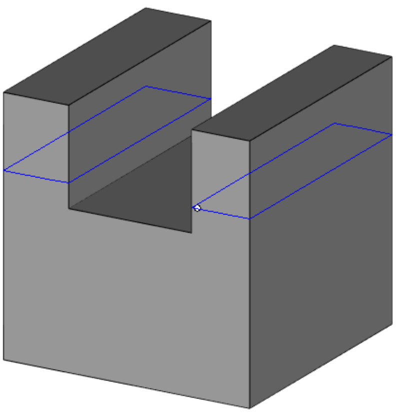
Defining parameters for clearance and spacing between the different cylinders

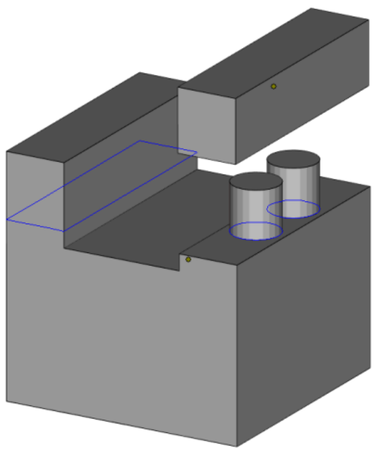



| | | |
|---|---|---|
| Top clearance | Clearance add the end of the pin | |
| Side clearance | Clearance that should be applied to the sides of the pins | |
| Spacing | Indicate the distance there must be between the pins.<br>*Remark*: The actual spacing between the pins differs in some cases. | |
| Face clearance | You can decide to make a little gap along the cut. This way the two parts can easily slide into each other if you have to assemble them. | |
| | <br>Spacing = 4 mm | <br>Spacing = 12 mm |

If you have defined an connector Pins/ Holes section, and you only would like to perform the cut on a specific contour of the section, you can do so by using the ‘indicate contour’ function.

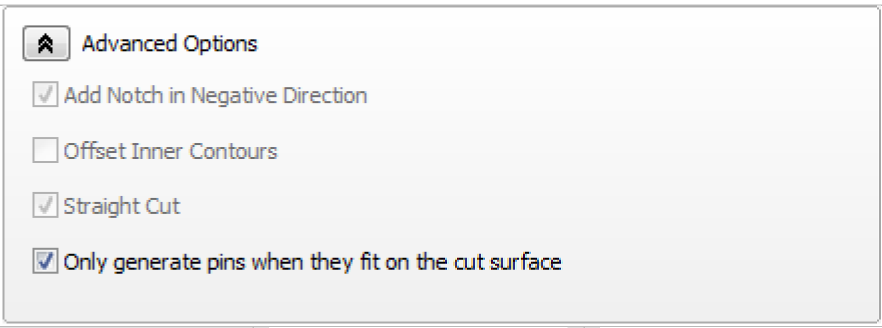
| | |
|---|---|
| Indicate contour | Select the contour (the intersection line between the part and the section) you would like to cut |
| Reset | Erases the defined contour section |

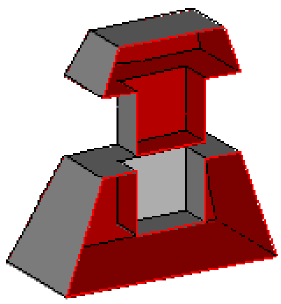
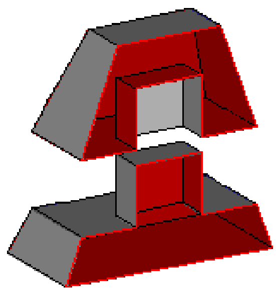
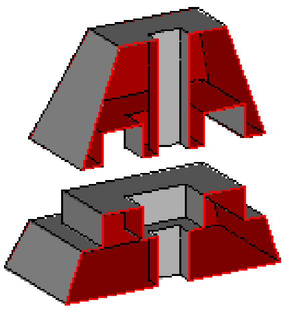
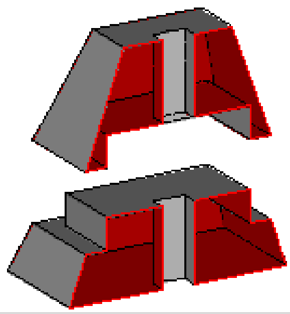
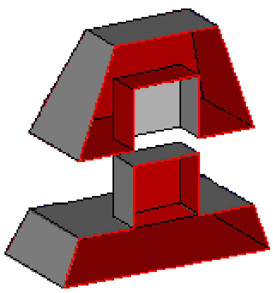
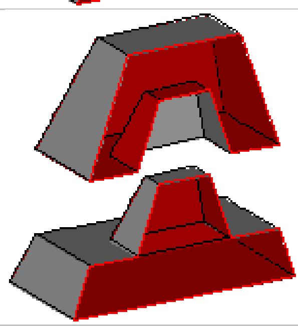




In the figure above a Z section is made. The contour on the right is selected, so only the right 'leg' will be separated from the main part using an advanced cutting.

### 3.3.2.8.4 Advanced options



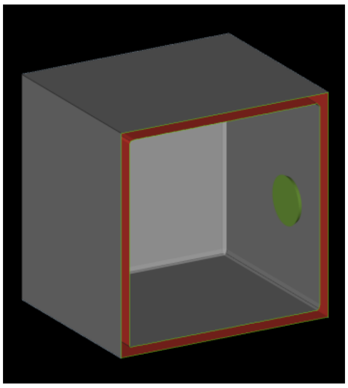

| | | |
|---|---|---|
| Add Notch in Negative Direction (Default OFF) |  |  |
| Offset Inner Contours (Default OFF) |  |  |
| Straight Cut (Default ON) |  |  |

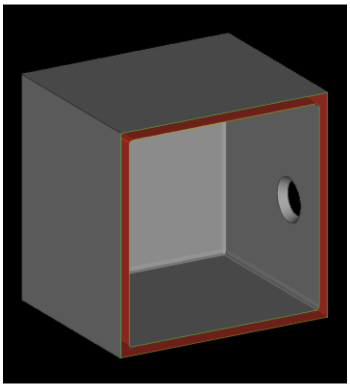
### 3.3.3 Perforator

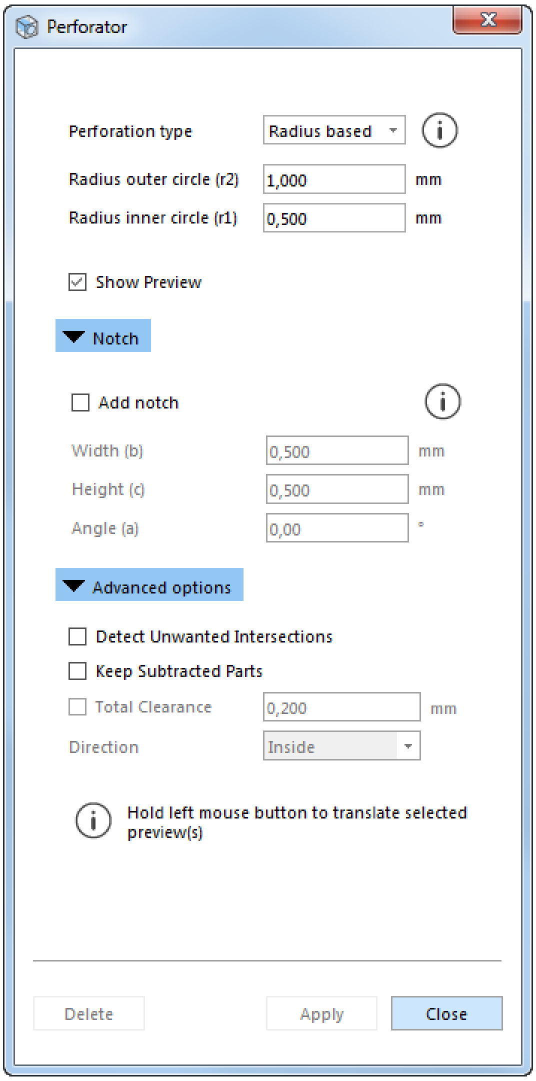

Perforator With this command you can make perforations through your parts. The perforation is defined by a flattened cone that will be subtracted from the part, thus creating a perforation. This is especially useful if you work with hollow parts or parts that are hollowed (See Hollow).

Firstly click on a point of the part to create a preview of the perforation. This preview is shown in BLUE color. When a preview is selected, this will be colored in GREEN.

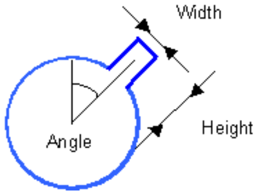
- Edit the parameters. Hold CTRL key to select multiple previews and edit them at the same time.
- Translate selected preview to the desired position by clicking and holding left mouse button.
- Apply preview(s) to the STL by clicking Apply.
- Delete selected preview(s) by pressing Delete key or Delete button.


Selected perforation preview

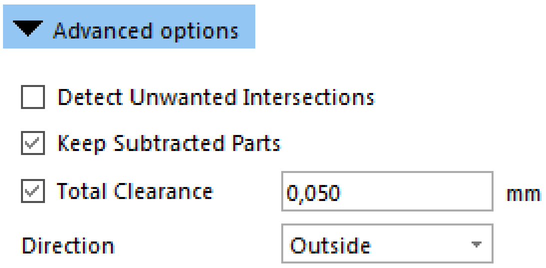

Perforation applied to the STL

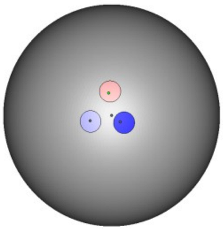
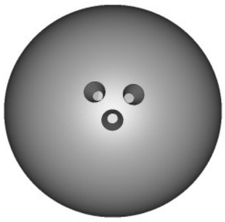



| | | |
|---|---|---|
| Perforation type | The perforation can be defined by either two radii (Radius based type), or one radius and an angle (Angle based type). | |
| | Radius outer circle (r2) | Here you determine the radius of the outer circle of the perforation. |
| | Radius inner circle (r1) | Here you can determine the radius of the inner circle of the perforation. |
| | Angle (a) | Here you can determine the angle of the perforation |
| Show preview | A 2D preview of the perforation is shown. This gives you immediately an indication of how the perforation will be executed. | |
| Notch | Add notch | You can choose to add a notch to the perforation. The notch is defined by the parameters Angle, Width and Height. The notch is particularly useful in combination with “Keep Subtracted Parts” option, for part alignment after printing the parts. |
| | Width | |
| | Height | |

| | | |
|---|---|---|
| | Angle |  |

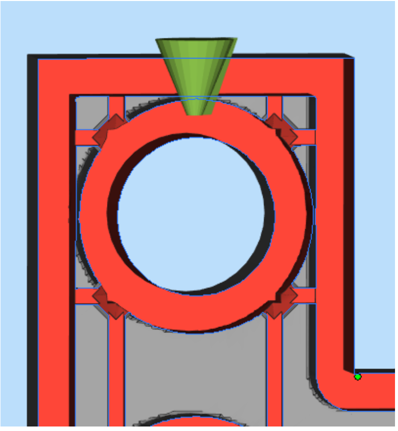
### 3.3.3.1 Advanced options



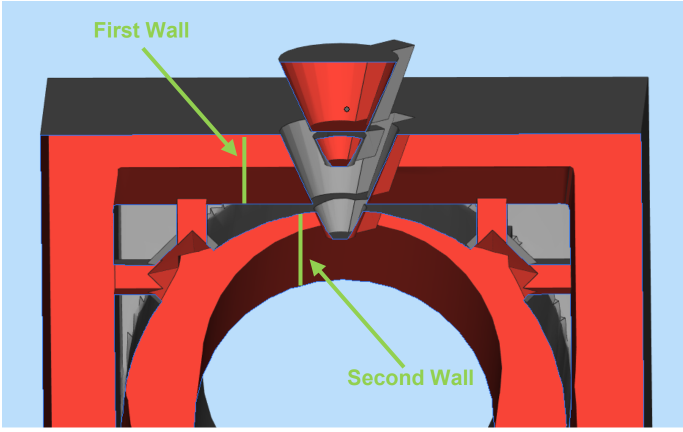

<table>
<tr><td>Detect Unwanted Intersections</td><td colspan="2">Collisions will be detected when the added cone is intersecting with more than one wall. (See remark)<br>Default OFF</td></tr>
<tr><td>Keep Subtracted Parts</td><td colspan="2">When checked, the subtracted part(s) are kept. If not checked subtracted part(s) are unloaded automatically.<br><br>With subtractions<br><br>Without subtractions</td></tr>
<tr><td rowspan="4">Total Clearance</td><td colspan="2">If you would like to have a little gap between the two parts that result from the perforation, you can add a clearance. This either to the inside, outside or on both sides.</td></tr>
<tr><td>Inside</td><td>Subtract clearance from cone</td></tr>
<tr><td>Outside</td><td>Subtract clearance from wall</td></tr>
<tr><td>Both sides</td><td>Subtract clearance from both: half of the clearance is taken from one side and half of clearance is taken from the other side</td></tr>
</table>

*Remark*: Unwanted Intersections

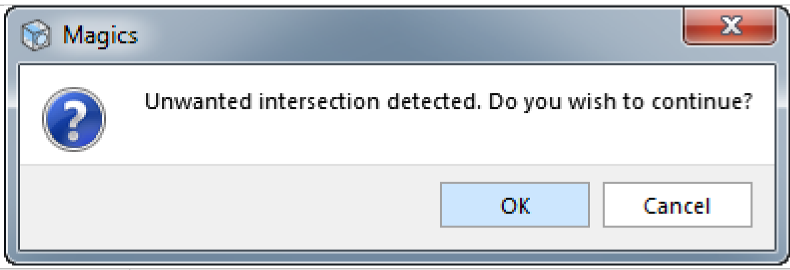
When you want to make a perforation, Magics might detect that an unwanted intersections will take place. Normally a perforation should go through only one wall (crossing just one red area). If the **detect unwanted intersections** option is selected, an unwanted intersection error will occur when the perforation goes through more than one wall of the same part. When you allow unwanted intersections, your subtracted part will be split into two pieces



Cone with unwanted intersection




Split cone as result of allowing unwanted intersections

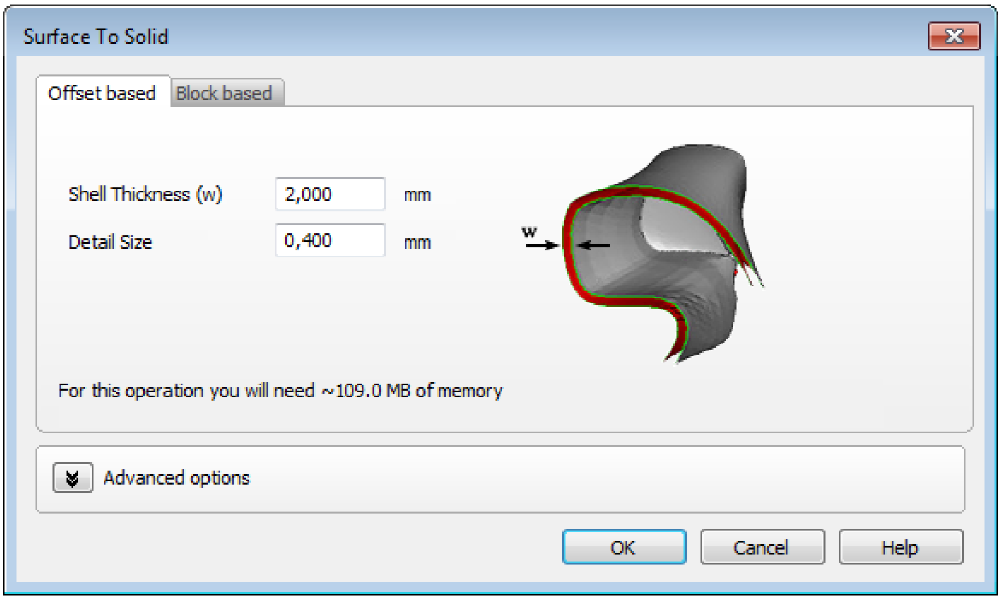


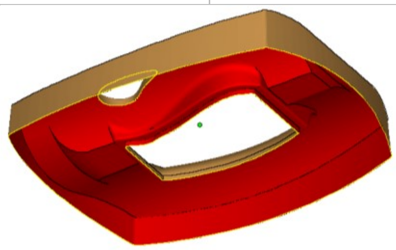
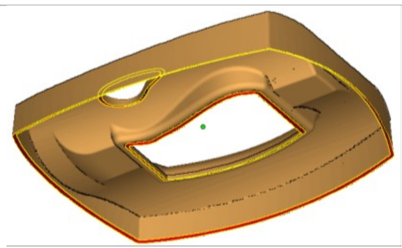

| | |
|---|---|
| Ok | The cone will be constructed with the intersection. |
| Cancel | The flattened cone is not constructed. |

### 3.3.4 Surface to Solid

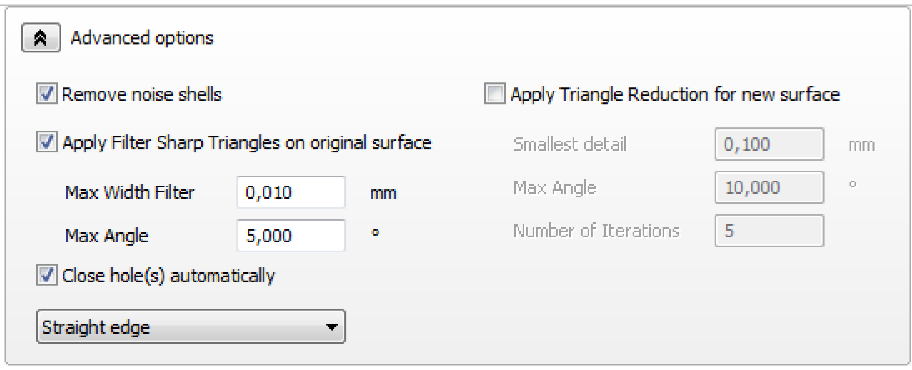

This function creates a solid from a surface. In some applications (e.g. GIS) only a surface is generated, but that cannot be built on an RP machine. Therefore you have to make a solid part.

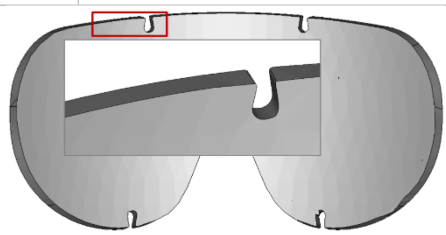
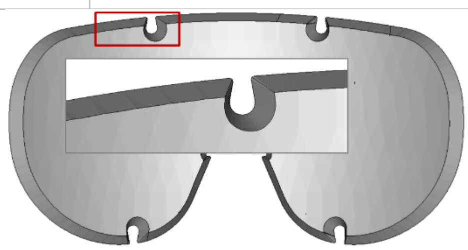
#### 3.3.4.1 *Offset based*




| | |
|---|---|
| Shell Thickness | This value displays the distance over which the triangles of the original shell get an offset in order to generate the required shell |
| Detail Size | This value displays the level of detail that will remain in the new shell. |
|  |  |
| Shell without thickness | Offset based thickness added to surface |

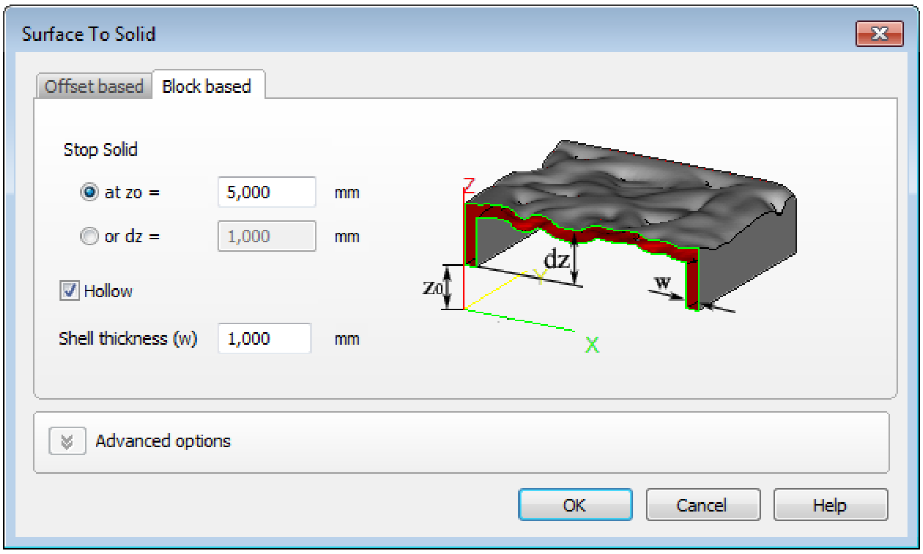
### 3.3.4.1.1 Advanced




| | | |
|---|---|---|
| Remove noise shells | Alle noise shells (no geometrical sense) are removed from the part | |
| Apply filter sharp triangles on original surface | Filter out long thin triangles on the original surface. | |
| | Max width filter | Triangles thinner than this distance will be marked or removed, depending on your choice. |
| | Max angle | The thin triangle will only be selected when the angle it makes with its neighbors is bigger than the given angle. This is easy to filter only thin triangles of folds and leave thin triangles of curves untouched. |
| Close hole(s) automatically | When checked, the gap in between the original surface and newly created surface is automatically closed | |
| | Straight edge | The gap in between the two surfaces will be closed by using a straight edge. |
| |  | |
| | Sloped edge | The gap in between the two surfaces will be closed by using a sloped edge, as the internally created surface is slightly smaller. |
| |  | |
| | When checked, Triangle Reduction is applied to the newly created surface. | |

| | | |
|---|---|---|
| Apply Triangle Reduction for new surface | Smallest detail | If 2 triangles are replaced by one triangle, there may be a little deviation in position. The tolerance indicates the maximum deviation allowed between the original surface and the new one. |
| | Max Angle | The Max Angle value defines two limits:<br>— When two triangles have an angle value bigger than Max Angle, they may not be reduced. The edge between them may not be eliminated; otherwise too much geometrical information would be lost. When the program meets such an edge, the reduction will keep the edge but reduce the number of points on it.<br>— When there is no critical edge, this Max Angle value determines the maximum angle that can be created during the reduction. This means where there is an edge present, there will remain one. Where there is no edge, no edge will be added. |
| | Number of Iterations | Magics can perform the operation in different iterations to improve the reduction of triangles. It is better to increase the number of iterations than performing the triangle reduction twice (to maintain the smallest detail). |

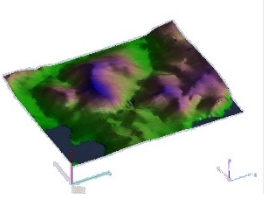
### 3.3.4.2 Block based



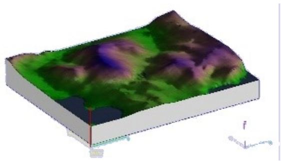

| | |
|---|---|
| Stop Solid at | The surface you want to make a solid from needs to be positioned above the XY plane. |

| | | |
|---|---|---|
| | z0 | Extrude the solid till this Z value |
| | dz | Extrude the solid over this Z distance |
| Hollow | You can hollow the solid to save material. | |
| | Shell Thickness (w) | The wall thickness of the hollowed solid. |

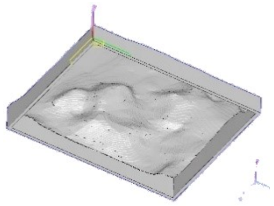
*Original Surface*



*Created Solid*



*Hollowed Solid*

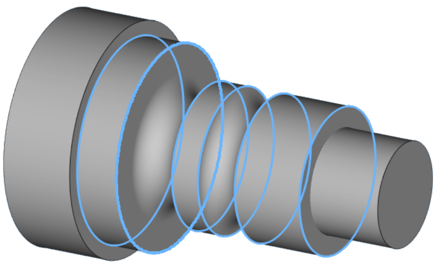


### 3.3.5 Fillet

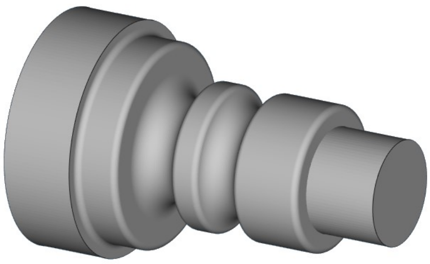
Fillet

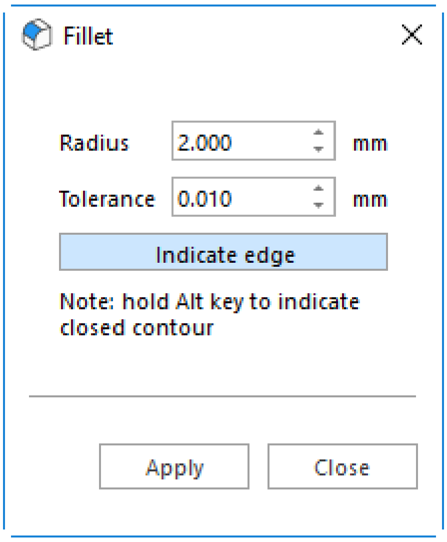
This command allows you to round interior and exterior sharp edges with a constant radius. Before applying the fillet, select single edge(s) of a part on the scene, or hold Alt key to select one closed contour. You can also select multiple edges and/or contours and run the fillet operation at the same time.

*Selected edges*



*Fillet*



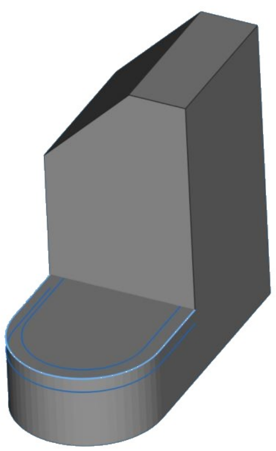



| | |
|---|---|
| Radius | This value defines the radius of the resulting circular edge. Fillet is performed with a constant radius over the entire edge. |
| Tolerance | This value determines the maximum deviation allowed between the circle drawn by the software (a polygon) and a parametric circle; the higher the tolerance, the bigger the deviation. The tolerance has also influence on the number of triangles that will be created. |

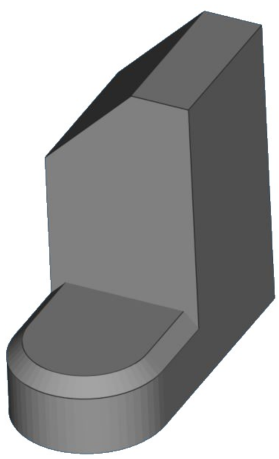
### 3.3.6 Chamfer

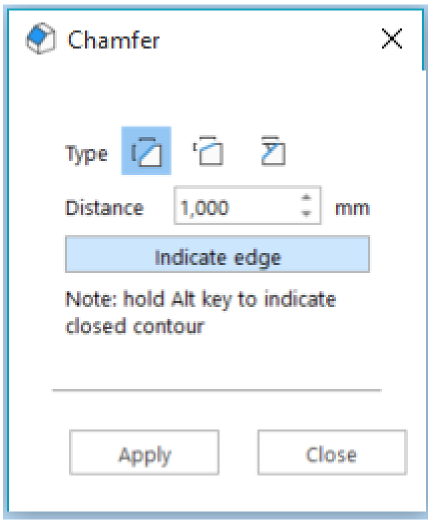

This command allows you to create a transitional edge between two surfaces of a part. Before applying the chamfer, select single edge(s) of a part on the scene, or hold Alt key to select one closed contour.

*Selected edges*



*Chamfer*

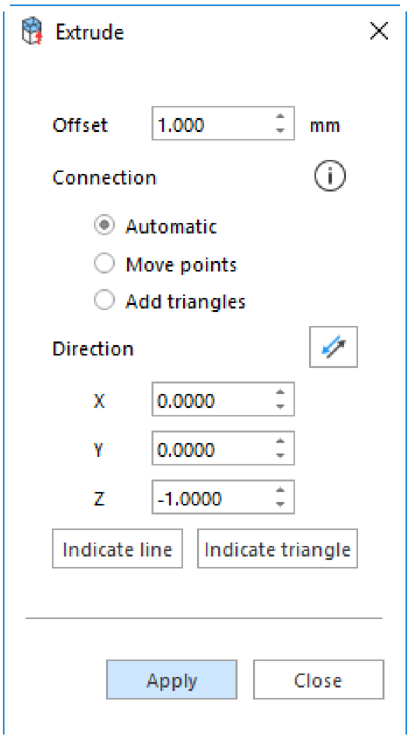


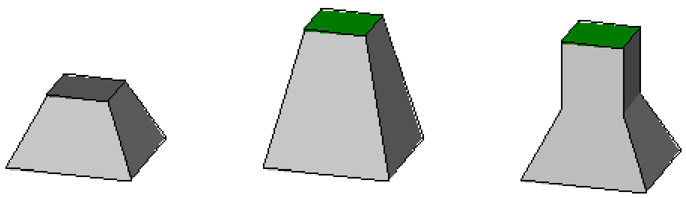



| | | |
|---|---|---|
| Equal distance | Distance | This value defines the equal distances calculated starting from the selected edges in both directions.. |
| Two distances | Distance 1 | This value defines the first distance calculated starting from the selected edges. |
| | Distance 2 | This value defines the second distance calculated starting from the selected edges. |
| | Reverse direction | When selected, Distance 1 and Distance 2 will be calculated as opposite. |
| Distance and angle | Distance | This value defines the distance calculated starting from the selected edges in one direction. |
| | Angle | This value defines the angle created by the part surface where the distance is calculated and the surface of the chamfer |
| | Reverse direction | When selected, the distance and angle will be calculated on the opposite side of the edge. |

### 3.3.7 Extrude

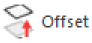
Extrude This command allows you to extrude triangles in a certain direction. Before the extrusion, you first have to mark the triangles you'd like to extrude. All marked triangles are moved in the same direction, over a defined distance.




| | | |
|---|---|---|
| Offset | The user must specify the extrude offset. Each triangle will undergo an offset in the defined direction over a distance defined by this value. The area of the surface formed by the triangles that are extruded will stay the same after extrusion. | |
| Connection | Move Points | The triangles adjacent to the selected triangles will be redrawn. They are stretched like shown in the figure below. The common points are moved. The area of the surface formed by the triangles that are extruded will stay the same after extrusion. The slope of the adjacent triangles will change a bit. |
| | Add Triangles | The triangles adjacent to the triangles that are extruded stay the same. The common points of the selected and adjacent triangles remain on their position. The gap between the latter and the triangles that have undergone an offset is filled with new triangles. This is shown in the figure below. |
| | Automatic | The program will make the choice between Move Points or Add Triangles. |
| | *Original part* *Move points* *Add triangles*  | |

| | | |
|---|---|---|
| Direction | Select the direction that the extrusion will follow. The direction is defined by a vector: fill in the coordinates in the X, Y and Z fields. | |
| | Reverse direction | You can click the Reverse direction button to quickly change the direction of the vector to the opposite side. |
| | Indicate line | You can click the Indicate line button and afterwards click on a line. The extrude offset will be in the direction of the line. |
| | Indicate triangle | You can click the Indicate triangle button and afterwards click on a triangle. The extrude offset will be in the direction of the triangle normal. |

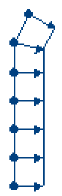
## 3.3.8 Offset



The Offset function allows offsetting the whole part or some selected triangles. The triangles are moved along a direction proper to the normal of that triangle over a defined distance, which is the same for all triangles.

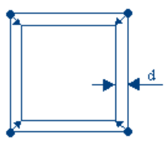
### *3.3.8.1 Offset Operation*

The offset will offset the points of the triangles over the offset distance in a direction defined by the mean of the normal of the triangles adjacent to the point. When looking at a 2D-representation the offset looks like this:



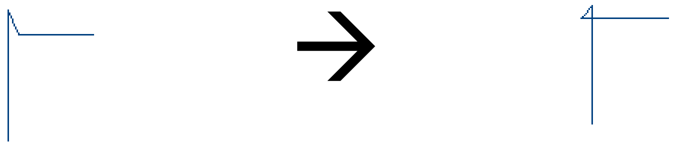
The nodes represent the corners of the triangles; the lines between the nodes represent the triangles; the arrows represent the direction and distance (the vector) of the offset. The offset works on open shells as shown in the example.

In case of a closed surface, we will get the following:



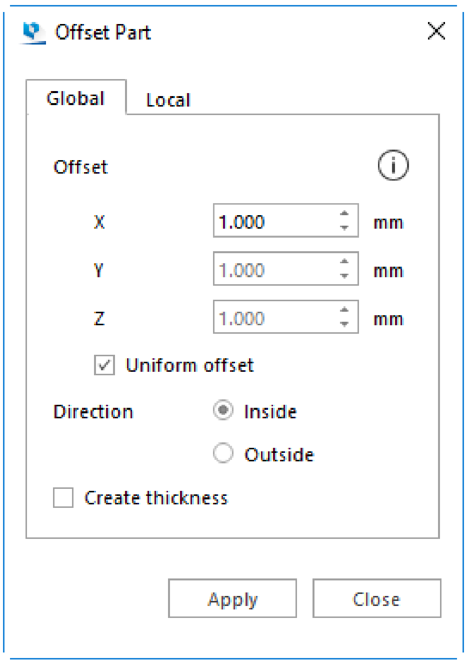

The nodes represent the corners of the triangles; The lines between the nodes represent the triangles; The small arrows represent the direction and distance (the vector) of the offset; 'd' represents the distance one would measure. This will be smaller than the offset distance mentioned in the dialog box.

If the STL-file you are working on has some irregularities like in the figure below, the result may not be as expected, but as shown in the right figure.



So when you have STL noise, the offset could amplify the noise at bad portions of your part. Therefore we would recommend not using this feature for offsetting over large distances, it is better to use hollow ([Menu/ Tools/ Hollow]) with the option keep core checked.

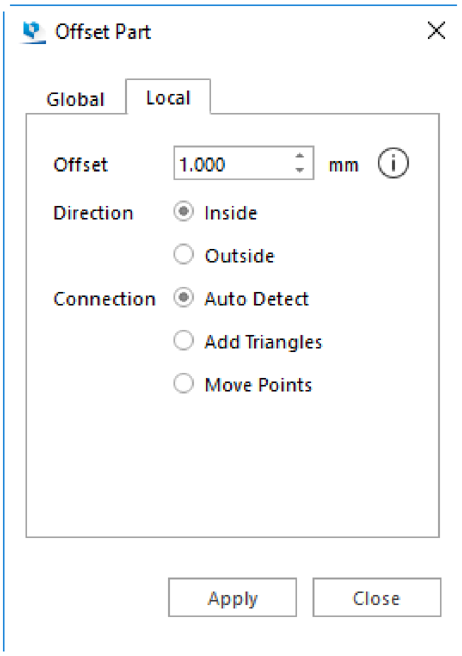
### *3.3.8.2 Global*



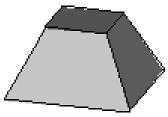
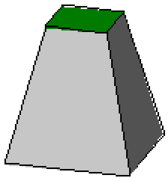
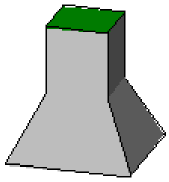

| | |
|---|---|
| Offset | In this field, you enter the offset value. Each triangle will be moved along the direction of its normal over a distance set by the offset value. |
| Uniform | Select uniform if you wish that the offset is uniformly applied in X, Y and Z. If you switch it off, the dialog box will change so you can put different offset values in the X, Y and Z direction fields. |
| Direction | Choose whether you want the offset to be inward or outward. |
| Create thickness | If you selected global you can choose to create a thickness. In this case, the original shell will remain and a thickness is created. |

### 3.3.8.3 *Local*

You can select (mark) triangles on the part that you would like to offset. These triangles will move. The algorithm is made so that no holes are introduced. There are two possibilities to fill the gap that rises when some triangles have undergone an offset:




| | | |
|---|---|---|
| Offset | In this field, you enter the offset value. Each triangle will be moved along the direction of its normal over a distance set by the offset value. | |
| Direction | Choose whether you want the offset to be inward or outward. | |
| Connection | Move Points | The triangles adjacent to the selected triangles will be changed. They are stretched like shown in the figure below. The common points are moved. The area of the triangles selected remains the same after the offset. The slope of the adjacent triangles will change a bit. |
| | Add Triangles | The common points of the selected and adjacent triangles remain on their position. The gap between these triangles and the triangles that have undergone an offset is filled with new triangles. This is shown in the figure below. |
| | Auto Detect | The program will make the choice between Move Points or Add Triangles. |

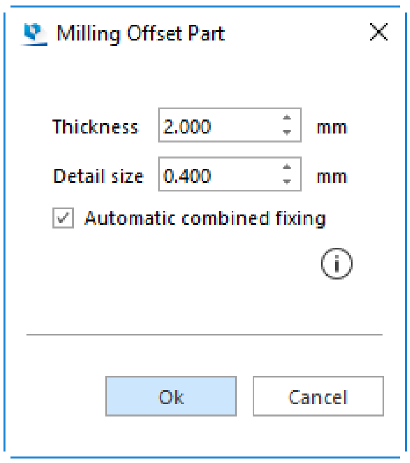
| | Original part | Move Points | Add Triangles |
|---|---|---|---|
| |  |  |  |

*Remark:* The local offset differs from the Extrude operation. In an extrude operation all triangles are moved along the same direction. In the local offset operation, the direction of offset depends on the triangle and its neighbors.

### 3.3.9 Milling offset

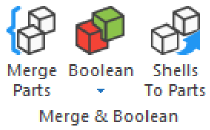
The milling offset will add a specified thickness for the marked triangle(s), the edges of the marked area are rounded based on the specified detail size.

By adding this thickness there will be no distortion of the original surface contour.




| | |
|---|---|
| Thickness | The amount of material to be added. |
| Detail size | This value displays the level of detail that will remain. As a rule, this value should be the same as the smallest detail of the part. The smaller this value, the more triangles will be included and the more detail can thus be incorporated. |
| Automatic combined fixing | Run automatic combined fixing after the milling offset operation to fix small errors. |

## 3.4 Merge & Boolean



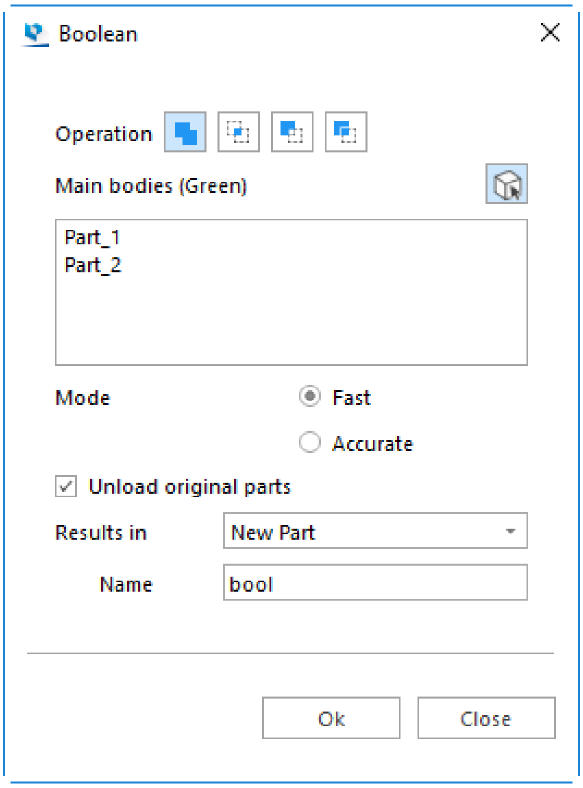

### 3.4.1 Merge Parts


Shells can be merged to one STL part. This function is used to save all loaded parts as one STL. This is the inverse operation of Convert Shells to Parts. Please note that merge will not remove intersecting volumes, like the Boolean operation will do.

### 3.4.2 Boolean


Using the Boolean operation enables you to combine different designs. There are four kind of Boolean operations: Unite, Intersect, Subtract and Clip. At least two parts need to be selected to perform a Boolean operation.

Indicate parts button will allow user to select/deselect parts directly from the scene; the selected parts will be added to the list in the Boolean dialog. Moreover, once a part is selected, it will change color on the scene. To deselect a part, user can click again on the part from the scene, or select one part in the list and press Delete key. In case of Subtract and Clip operations, two different lists are present; user can also drag and drop parts from one list to the other to use them as main bodies or bodies to subtract.




— Unite

The *Unite* command merges the selected files into one file and trims all the surfaces to make one shell of both parts. There is no limit on the number of files that can be united. The files need to be selected.

— Intersect

The intersection of several parts is made with the Intersect command. There is no limit on the number of files that can intersect. The files need to be selected.

— Subtract

To subtract one part from the other, the user has to specify which part has to be subtracted from the other. The selected parts automatically get two different colors: the main body is green and the part to subtract is red. There is no limit on the number of parts that can be subtracted. The parts need to be selected.

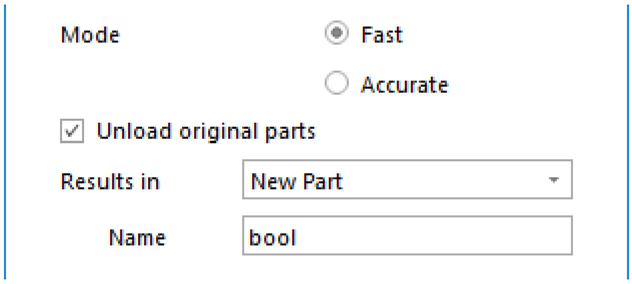
The user has to option to set a clearance for Subtract operation. If this option is checked, the intersecting line gets an offset towards the inner side. This way the user can introduce a little gap between the parts that result from the subtraction; the gap is defined by the clearance value.

— Clip

Clip operation can be used to create pins or fitted parts in one step. With this operation, user can perform two Boolean operations at the same time: one Intersect operation and one Subtract operation. Each operation will result in the end into a separate part. There is no limit on the number of parts that can be clipped. The parts need to be selected.

The user has to option to set a clearance that will be used during the Subtract operation. If this option is checked, the intersecting line gets an offset towards the inner side. This way the user can introduce a little gap between the parts that result from the subtraction; the gap is defined by the clearance value.

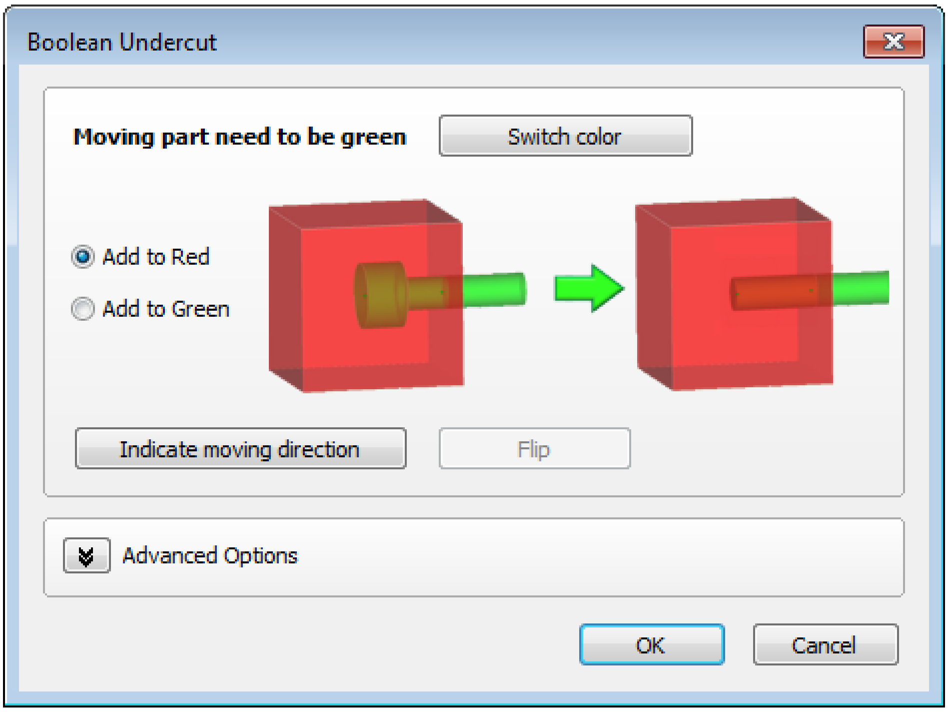
— General options



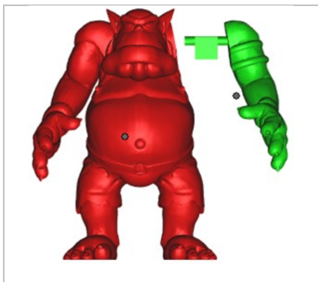
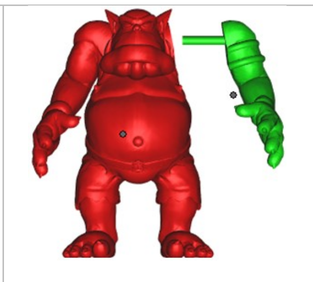
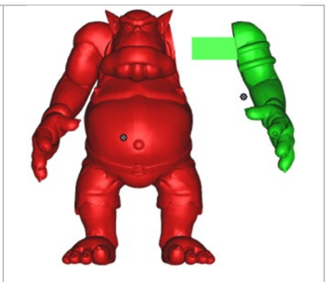

| | |
|---|---|
| Mode | It is recommended to use Fast option; this option is selected by default. In some specific cases, issues on resulting part might appear; in this cases, user can switch to Accurate option for better results. |
| Unload original parts | The original parts can be unloaded after the Boolean operation. Therefore the Unload Originals checkbox should be checked. This option is by default ON. |
| Result in | The general principle of a Boolean operation is that a new part is created as the result of the interaction between the selected parts. User can also decide to assign the results of the Boolean operation to an existing part, by selecting it in the dropdown menu. |
| Name | The name of the resulting part. This option is enabled only if resulting part is a new part. |

### *3.4.2.1 Boolean undercut*

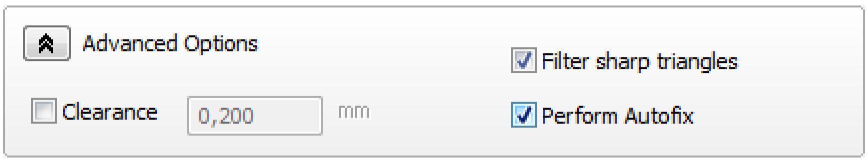
The Boolean undercut is mostly used in complex situations where the end product is build in separate parts that need to be assembled afterwards. It will detect undercuts along an indicated direction and will then decide to add material from one part to another to have the easiest assembly after the parts have been produced.




| | |
|---|---|
| Switch color | Switch the red and green color of the parts |
| Add to red/ Add to green | Indicate to which part (red or green) the material effected by the undercut should be added. |
| Indicate moving direction | Indicate in which direction the undercut detection needs to be performed |
| Flip | Change the direction to the opposite direction |

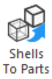
| | | |
|---|---|---|
|  |  |  |
| Starting point | Add to Red | Add to Green |

### 3.4.2.1.1 Advanced options



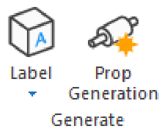
| | |
|---|---|
| Clearance | At an offset in between the resulting parts. This way you introduce a little gap between the parts that result from the cut. |
| Filter sharp triangles | Remove sharp triangles created during the operation |
| Perform Autofix | Simple fixing steps are performed on the parts automatically. |

### 3.4.3 Convert Shells to Parts



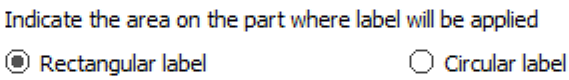
If a part consists of several shells, it can be divided so that every shell becomes a distinct part. These parts will be named "shell_#_of" where # is a number. The parts will be sorted in order of amount of triangles. Shell_1 has more triangles than shell_2. This is the inverse operation of Merge Parts.

## 3.5 Generate

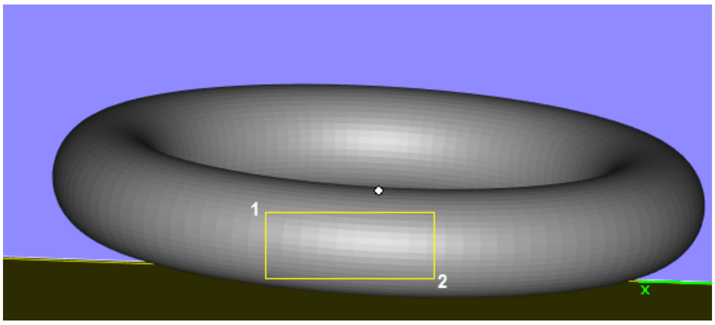



### 3.5.1 Label

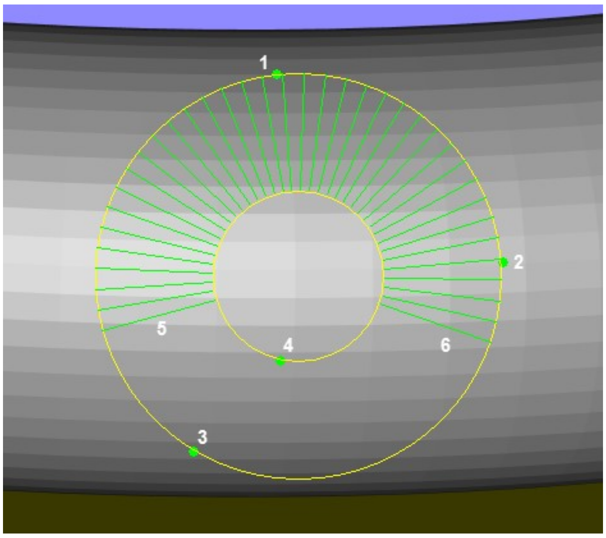
This feature allows you to put text or a figure on a part. First you need to indicate the area where you want the label to be applied. There are 2 options for the label. Or you chose to have a rectangular label or you chose for the circular label.

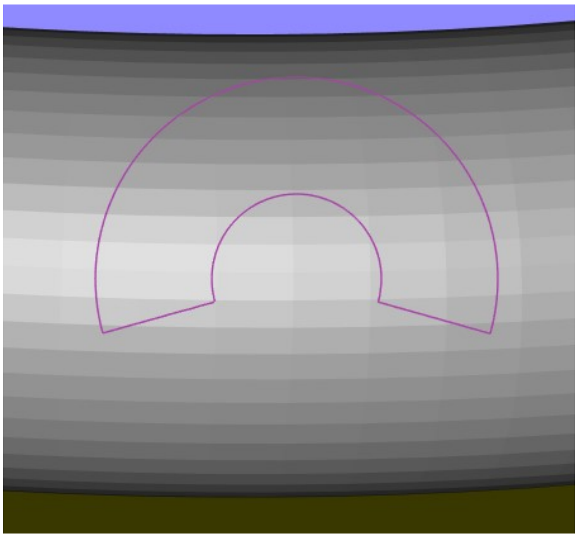


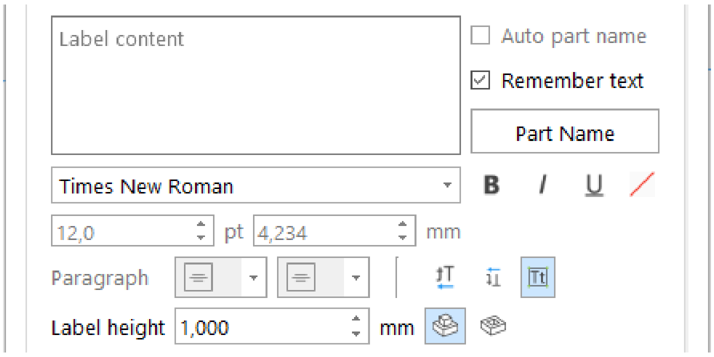

The rectangular label area needs to be defined by clicking on the part and drawing a rectangle. In the picture point 1 is the starting point of the rectangle, point 2 is the end point. This rectangular area can then be used as label area. Make sure the label area completely fits on the part. A warning message will be shown when the label doesn't fit on the part.



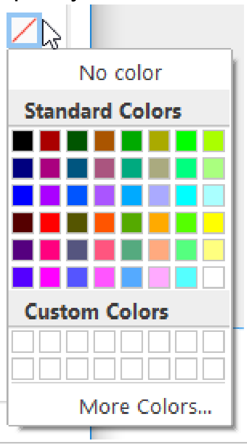

The circular label area needs to be defined by defining 3 points to define the main circular shape. The fourth point will define the size of the label area. The fifth and sixth click will determine the start and end point of the label area.






| | | |
|---|---|---|
| Label content | Specify in this box the text which should be used as label content. | |
| | Auto part name | Add the part name of the selected part automatically to the label content. |
| | Remember text | The last entered value will be remembered the next time the labeling functionality is used. |

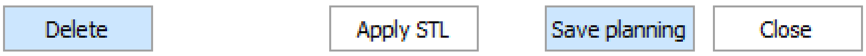
| | | |
|---|---|---|
| | Part name | Pushing this button will automatically add the current part name to the label content. |
| Font options | Font | Specify the font type for the label. |
| | Bold | Select if the font should be Bold. |
| | Italic | Select if the font should be Italic. |
| | Underline | Select if the font should be Underlined. |
| | Color | Specify the color for the label.   |
| | Font size | Specify the dimension of the label text. The dimension can be specified in mm or pt. If the dimension is specified in mm, then the size in pt will be automatically deduced. If the dimension is specified in pt, then the size in mm will be automatically filled in. * |
| Paragraph options | Paragraph<br>Paragraph | Will work only if Fit text to label boundaries is switched off. Align the text in the label area to Left/Center/Right or Top/Middle/Bottom. |
| | Flip | The label content will be flipped before being applied. |
| | Mirror | The label content will be mirrored before being applied. |
| | Fit text to label boundaries | Will use the maximal possible size of the text in the label planning area. Overrules any specification on Font size (Font size is greyed out if Fit text to label boundaries is checked). |
| Label height | Specify the height of the label (in or outside). | |
| | Raised / Engraved | Specify if the label needs to be raised (outside) or engraved (inside). |

* How is the size determined?

The Size of the text is dependent on the selected Font. The Size of the text is calculated as the distance between the tallest letter and the lowest letter of the selected Font, regardless of the letters used in your label. This makes it easy to be constant in the sizes of the labels created across your applications. It also provides the same understanding and application of Font Size between Magics and other software programs that you are using.

— Advanced options


| | |
|---|---|
| Label through | Use this option to label multiple parts at once with the same label. Make sure the parts are aligned perpendicular to the view |
| Show preview | The preview of the label content textbox will be automatically updated in the label planning area. |
| Save separate STL | The label will be generated as a separate part. |
| Auto save label area | The label planning area on the part is automatically saved on the part when applied. If the box is unchecked, then the label area will be saved only when the button Save planning (at the bottom of the window) is pressed. |




| | |
|---|---|
| Delete | Use this button to delete previously defined label planning areas. |
| Apply STL | Pressing this button will generate the label and modify the STL. |
| Save planning | Pressing this button will keep the label planned, but not yet generate it as STL. It can still be edited in a later stage. |
| Close | Press this button to close the dialog. |

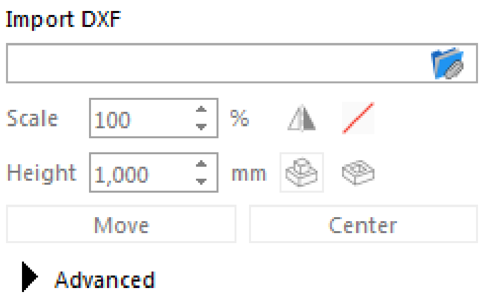
** In order to process the Label Planning by a Build Processor, an extra license is required and you will have to reach out to your local Materialise contact for it. If the Label Planning is Applied as STL before saving the project and sending it to the Build Processor, no extra license is required.*

#### *3.5.1.1 Save label to STL*

A part with label planning can be saved as STL, without having to apply the Label to STL in the Label window. The user needs to go to File -> Save as and select STL as the file format. The user will be asked if he/she wants to apply the label planning to the part as an STL. If selected yes, the label with be saved as STL to the part and the part will be saved in a STL file.

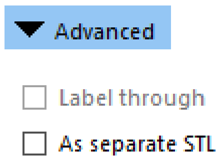
The part with Label planning inside Magics will remain unchanged. So the user can continue editing the label planning or save the part with label planning as a Magics project for later editing.

### 3.5.1.2 *Drawing*




| | | |
|---|---|---|
| Import DXF | Browse to the wanted DXF file by clicking on the folder icon. | |
| Scale | Resize the label to the desired size. | |
| Move | Pushing this button allows you to move the 2D label over your screen in order to position it in the optimal position. | |
| Center | Reposition the label text in the center of the screen. | |
| Color | Select the color to be applied on the label. | |
| Height | Specify the height or depth of the label. | |
| | Raised / Engraved | Choose whether the label should go inside the part or be placed on top of the part |

— Advanced Options

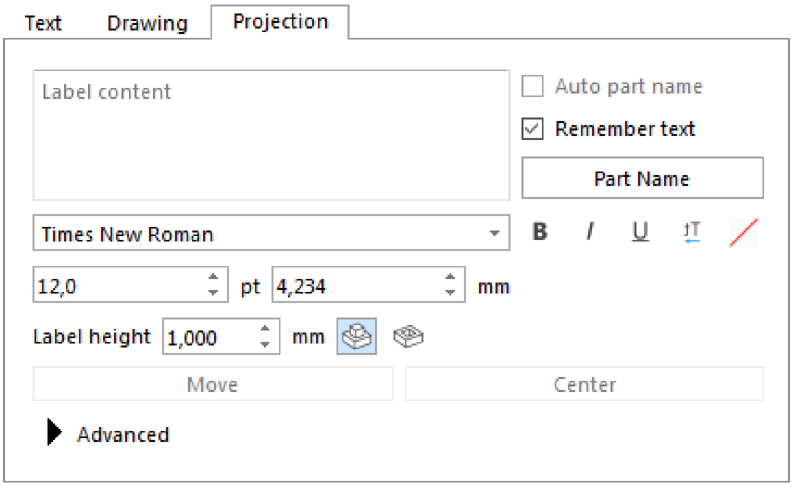


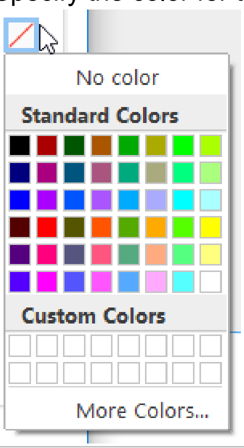

| | |
|---|---|
| As separate STL | The text will be a separate part. |

*Remark*: Pieces of the part can be hidden by using a section view, this allows you to apply labels in the most flexible way.

### 3.5.1.3 *Projection*

This feature allows you to put text on a part, without having to make a planning first. The label text is first shown on the screen and then perpendicularly projected on the part when applying the label.



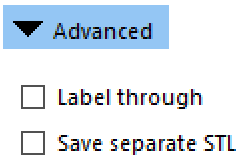

| | | |
|---|---|---|
| Label content | Specify in this box the text which should be used as label content. | |
| | Auto part name | Add the part name of the selected part automatically to the label content. |
| | Remember text | The last entered value will be remembered the next time the labeling functionality is used. |
| | Part name | Pushing this button will automatically add the current part name to the label content. |
| Font options | Font | Specify the font type for the label. |
| | Bold | Select if the font should be Bold. |
| | Italic | Select if the font should be Italic. |
| | Underline | Select if the font should be Underlined. |
| | Mirror | The label content will be mirrored before being applied. |
| | Color | Specify the color for the label.   |
| | Font size | Specify the dimension of the label text. The dimension can be specified in mm or pt. If the dimension is specified in mm, then the size in pt will be automatically deduced. If the dimension is specified in pt, then the size in mm will be automatically filled in. * |
| Label height | Specify the height of the label (in or outside). | |

| | | |
|---|---|---|
| | Raised / Engraved | Specify if the label needs to be raised (outside) or engraved (inside). |
| Move | Pushing this button allows you to move the 2D label over your screen in order to position it in the optimal position. | |
| Center | Reposition the label text in the center of the screen. | |

* How is the size determined?

The Size of the text is dependent on the selected Font. The Size of the text is calculated as the distance between the tallest letter and the lowest letter of the selected Font, regardless of the letters used in your label. This makes it easy to be constant in the sizes of the labels created across your applications. It also provides the same understanding and application of Font Size between Magics and other software programs that you are using.

— Advanced Options



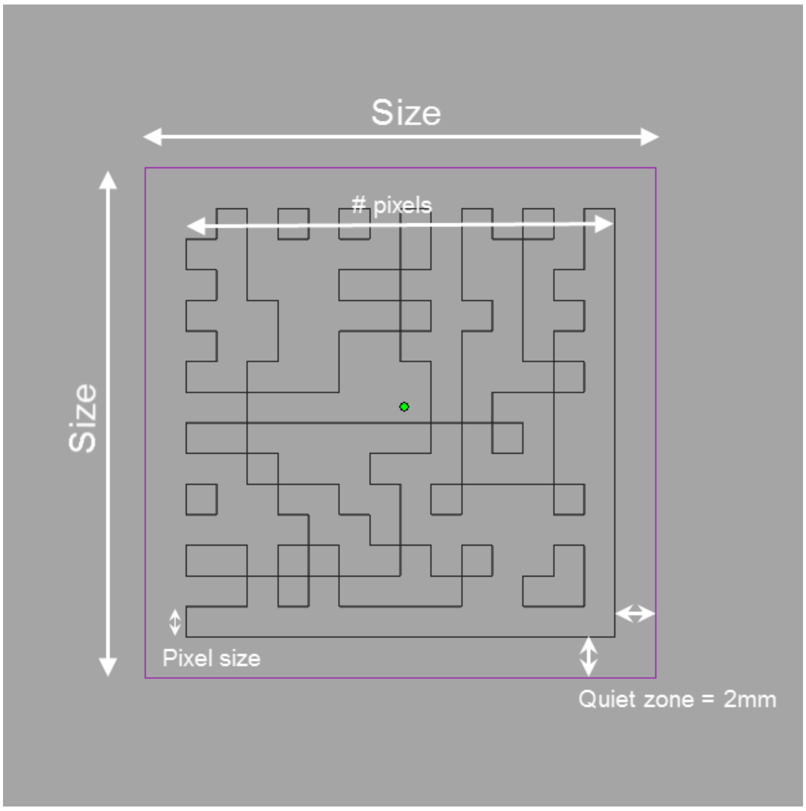

| | |
|---|---|
| Label through | Use this option to label multiple parts at once with the same label. Make sure the parts are aligned perpendicular to the view |
| As separate STL | The label will be generated as a separate part. |

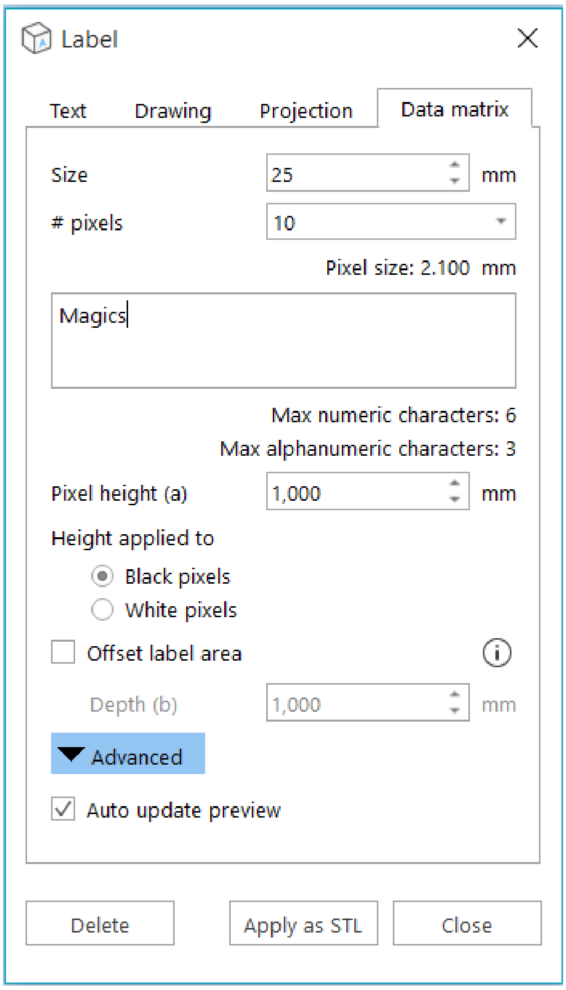
### *3.5.1.4 Data matrix label*

This feature allows you to convert text into a Data matrix and apply it to the part as STL. The user needs in the first place to select the area on the part where the label planning will be applied. Once a size is selected from the label window, a preview of the label planning area will be shown together with the mouse cursor. The user needs to position the cursor with the area on the part and click on the part to apply the label planning area.

Once applied, the label planning area can be selected and moved around the part, similar to label planning areas created with other label features.

The following parameters help define the data matrix within the label planning area:

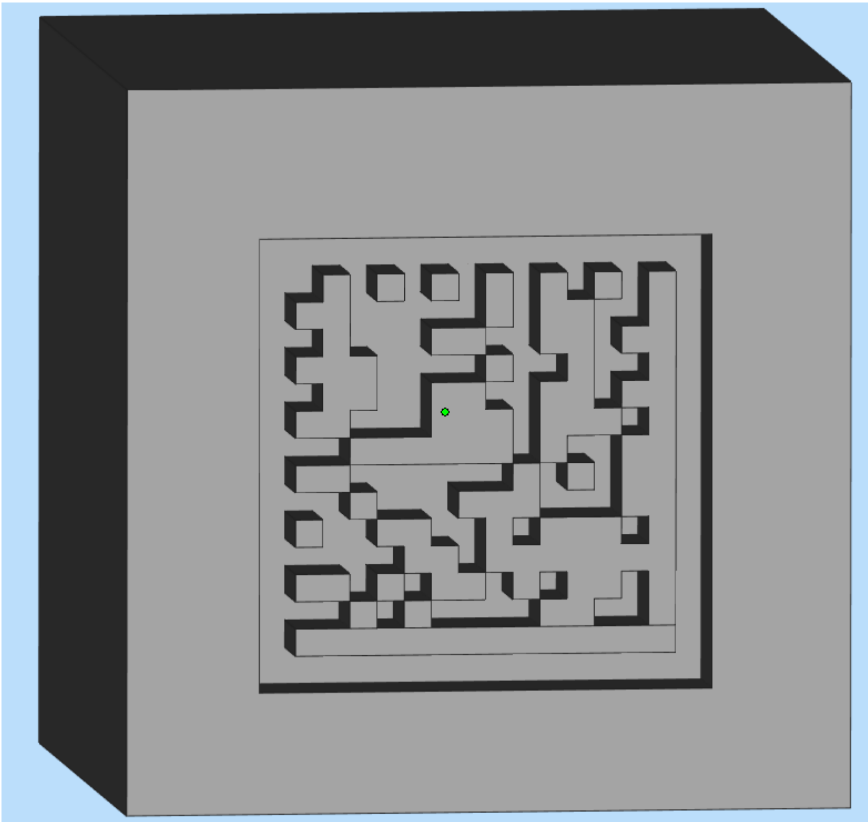

Size
Size
# pixels
Pixel size
Quiet zone = 2mm




| | | |
|---|---|---|
| Size | This parameters defines the size of the label planning area and, implicitly, of the data matrix. The default shape of the data matrix is a square, therefore all sides equal the value set for the parameter Size (mm). | |
| (Quiet zone) | The quiet zone is not specified in the UI. The value of the quiet zone is predefined and equals 2mm. | |
| # pixels | Defines the number of pixels that will appear on each side of the data matrix. The bigger the number of pixels, the larger amount of characters that can be encoded. | |
| Pixel size | (Size – Quiet zone)/Number of pixels | |
| Label content | The text that needs to be encoded | |
| Max numeric characters | The maximum number of numeric characters that can be encoded. | |
| Max alphanumeric characters | The maximum number of alphanumeric characters that can be encoded. | |
| Pixel height (a) | The height assigned to the pixels which will be read by the scanning device. | |
| Height applied to | Black pixels | The black pixels will be elevated. |
| | White pixels | The white pixels will be elevated. |

| | |
|---|---|
| Offset label area | Add an engraved margin around the label area. |
| Auto update preview | Adapts the preview according to the text inserted in label content. If the number of characters is more than can be encoded, then the preview disappears. |
| Delete | Removes a label planning area |
| Apply as STL | Applies the label planning as STL to the part |
| Close | Closes the window without making any changes. If the window is closed without applying the label as STL, then the label planning is automatically removed before the window is closed. |

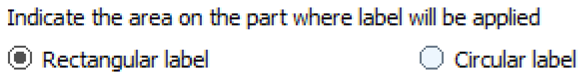
Result:



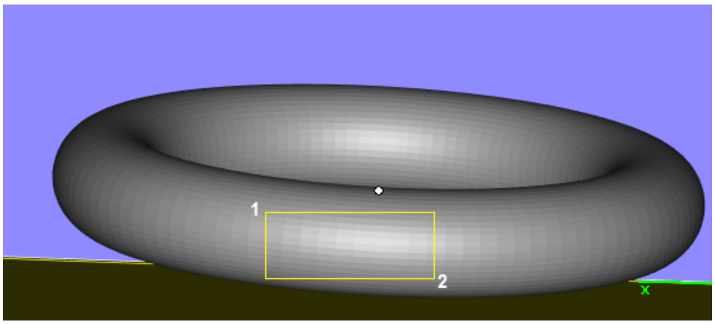
### 3.5.2 Mass Label

Mass Label

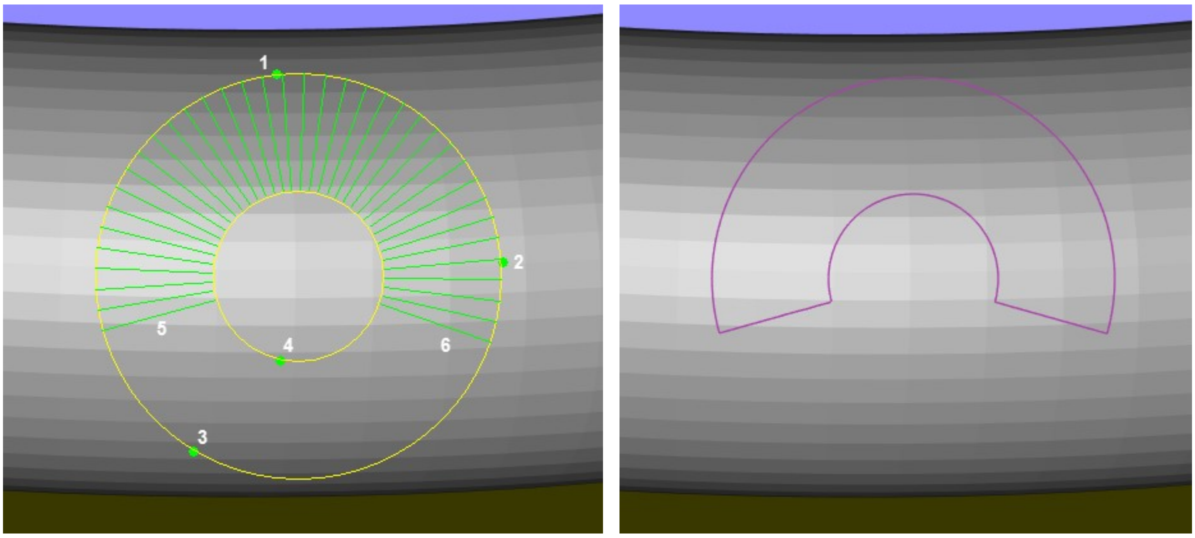
This feature allows you to apply a custom text label on a series of parts in a single batch. First the user needs to select the part which shall be used for the mass labeling operation. This part will be duplicated and a predefined label can be applied on the newly created part. When the master part is selected the user needs to define the label area. There are two different options for the label area: a rectangular label or a circular label.




The rectangular label area needs to be defined by clicking on the part and drawing a rectangle. In the picture point 1 is the starting point of the rectangle, point 2 is the end point. This rectangular area can then be used as label area. Make sure the label area completely fits on the part. A warning message will be shown when the label doesn't fit on the part.

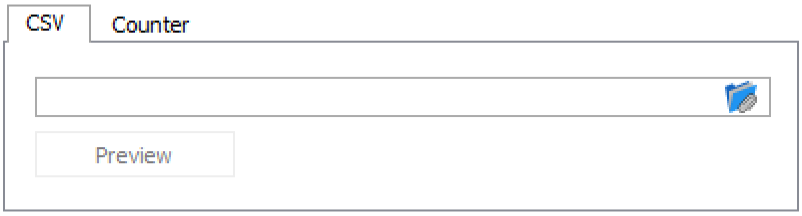



The circular label area needs to be defined by defining 3 points to define the main circular shape. The fourth point will define the size of the label area. The fifth and sixth click will determine the start and end point of the label area.

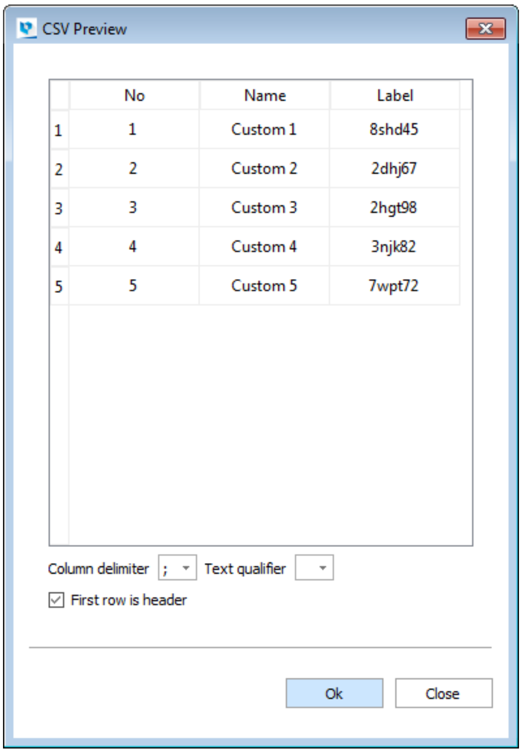



### 3.5.2.1 CSV labeling

The label content can be retrieved from a predefined CSV document from which the location needs to be specified inside the CSV tab.

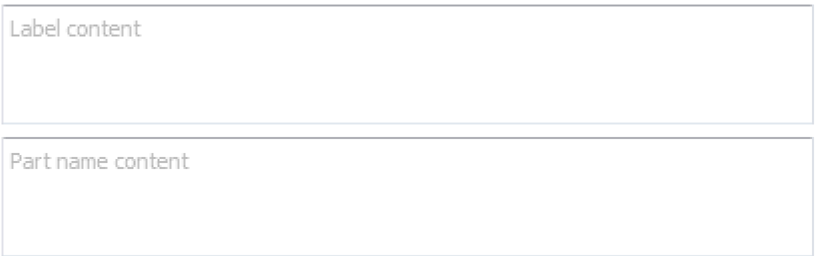


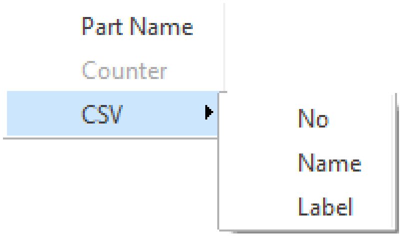

When a CSV file is selected the location will be visible in the CSV tab. Also a preview of the content is shown. In this window you can define if the first row will be used as header or not. You can use the first row to easily distinguish between different columns like for example final part name and label content. In our example it looks like this:



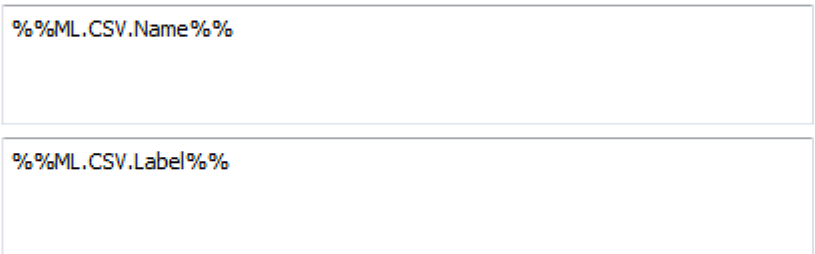

In the example below we use a file with 2 columns. The first column contains the desired part name after the mass labeling operation and the second column contains the label content for the specific parts.

Once a proper CSV document is selected the label content and part name content edit boxes become active. You can type any text in these text boxes or use the Add content button. Behind this button you can choose the part name or the content from the CSV file. As you can see in this example there are 2 CSV options: Name and Label.

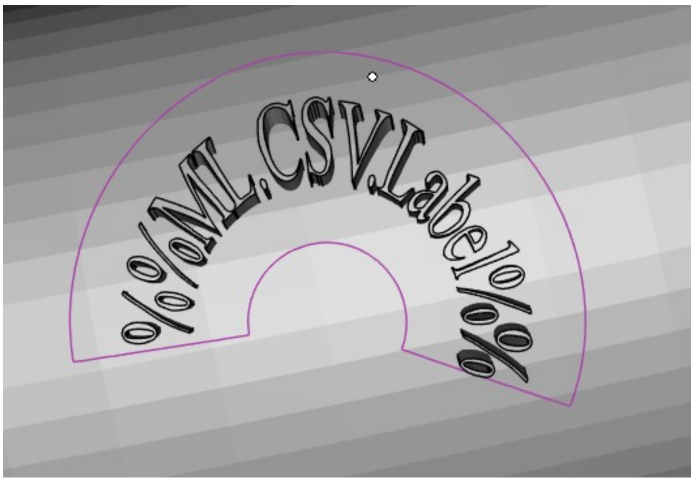



After selecting the name and label for the desired result the editboxes look like this




Also a preview is shown in the label planning area.

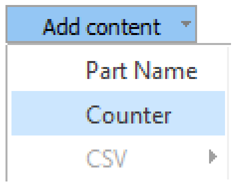


### 3.5.2.2 *Counter labeling*

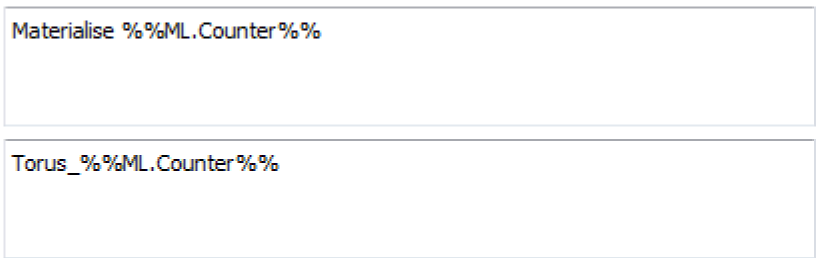
In addition to the CSV labeling option you can add a counter to a label which you can specify manually in the Label content editbox.


The counter allows you to define the number of copies that will be created and also allows you to create a unique label content by use of a counter.

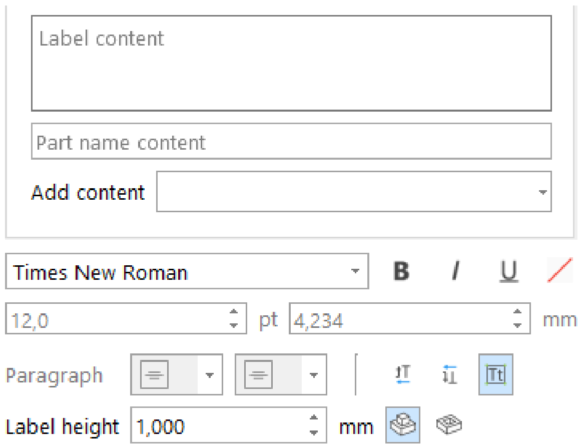
In the Add content dropdown menu you can select the counter option which can be added in the Label content and Part name content editboxes.

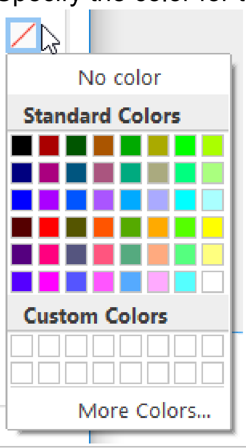



In this case a possible option would be:




Finally some additional parameters can be defined for the label.

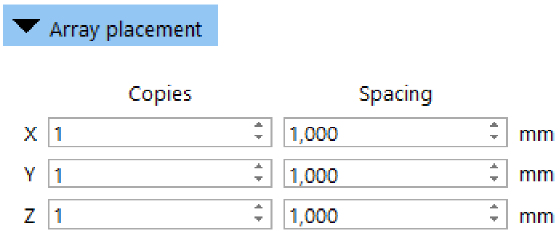



| | | |
|---|---|---|
| Add content | Use this dropdown button to load counter content in the label area and in the Part name area. | |
| Font options | Font | Specify the font type for the label. |
| | Bold | Select if the font should be Bold. |
| | Italic | Select if the font should be Italic. |
| | Underline | Select if the font should be Underlined. |
| | Color | Specify the color for the label.   |
| | Font size | Specify the dimension of the label text. The dimension can be specified in mm or pt. If the dimension is specified in mm, then the size in pt will be automatically deduced. If the dimension is specified in pt, then the size in mm will be automatically filled in. * |
| Paragraph options | Paragraph | Will work only if Fit text to label boundaries is switched off. Align the text in the label area to Left/Center/Right or Top/Middle/Bottom. |
| | Flip | The label content will be flipped before being applied. |
| | Mirror | The label content will be mirrored before being applied. |
| | Fit text to label boundaries | Will use the maximal possible size of the text in the label planning area. Overrules any specification on Font size (Font size is greyed out if Fit text to label boundaries is checked). |

| | | |
|---|---|---|
| Label height | Specify the height of the label (in or outside). | |
| | Raised / Engraved | Specify if the label needs to be raised (outside) or engraved (inside). |

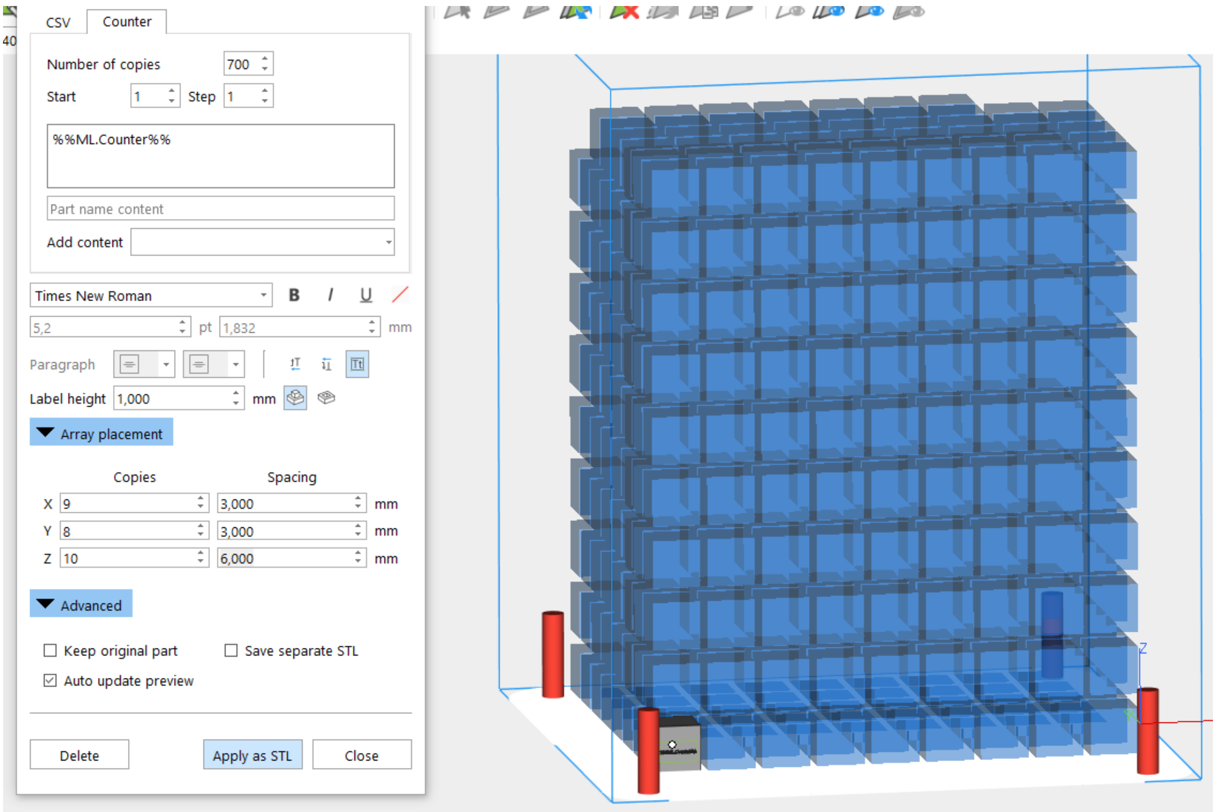
* How is the size determined?

The Size of the text is dependent on the selected Font. The Size of the text is calculated as the distance between the tallest letter and the lowest letter of the selected Font, regardless of the letters used in your label. This makes it easy to be constant in the sizes of the labels created across your applications. It also provides the same understanding and application of Font Size between Magics and other software programs that you are using.

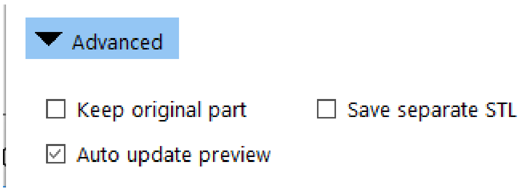



The parts can be positioned on the platform by using the Array placement. Both negative and positive values can be used for Spacing.

A preview of the arrangement is shown automatically. To switch this off, in Advanced settings, the checkbox Auto update preview needs to be unchecked.



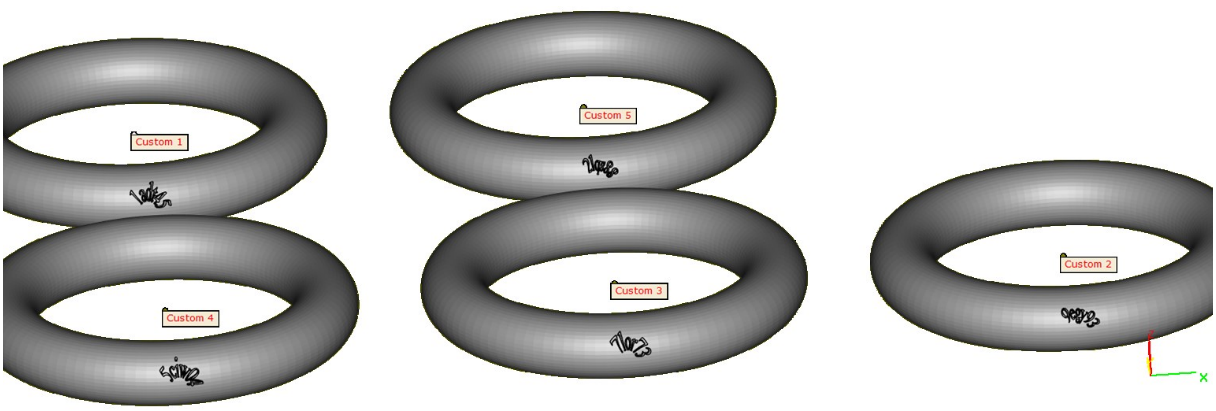
The advanced options:



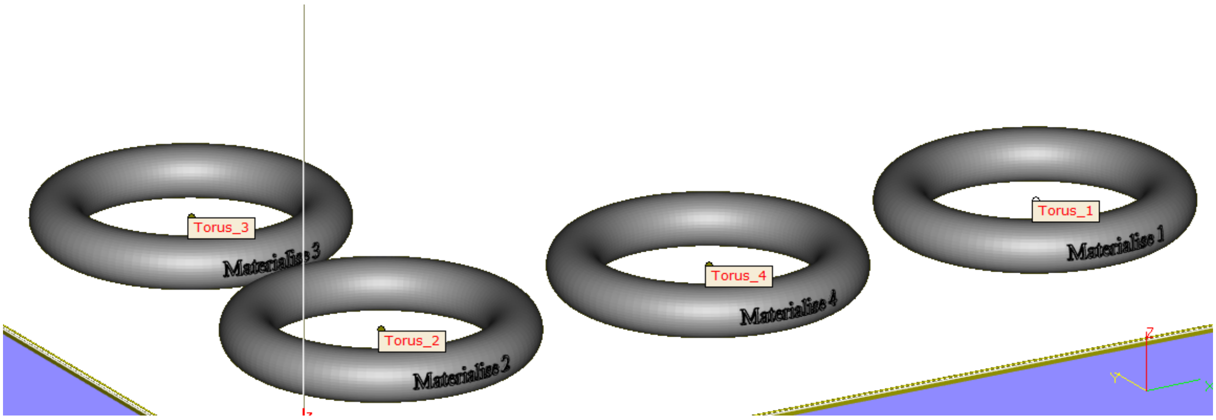

| | |
|---|---|
| Keep original part | The master part used for the mass labeling will be kept after the operation. |
| Automatically update preview | The content of the label content textbox will be automatically updated in the label planning area. |
| As separate STL | The label will be generated as a separate part. |


| | |
|---|---|
| Delete | Pressing this button will allow you to go in the delete mode to actually delete previously created label planning areas. |
| Apply as STL | Pressing this button will generate the mass labels according to the settings specified in the mass labeling dialog. |
| Close | This button will close the dialog without performing the actual mass labeling operation. |

In our example for the CSV labeling the result will be as follows after the label is applied. 5 parts with all different labels and different part names.



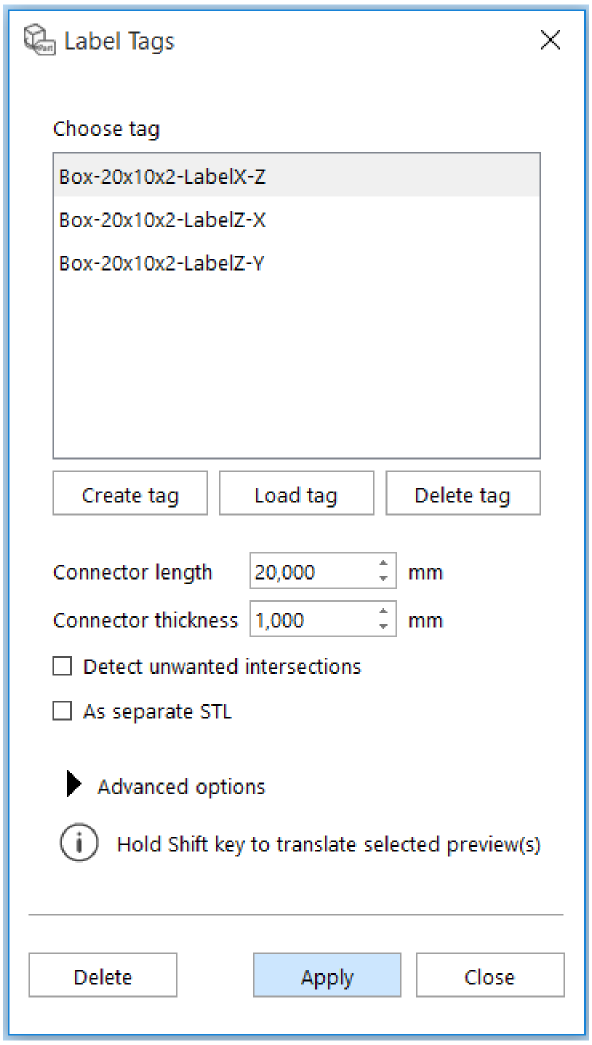

In the case of the counter labeling example, the result would be like this: 5 parts with all a unique name and label defined by the counter.

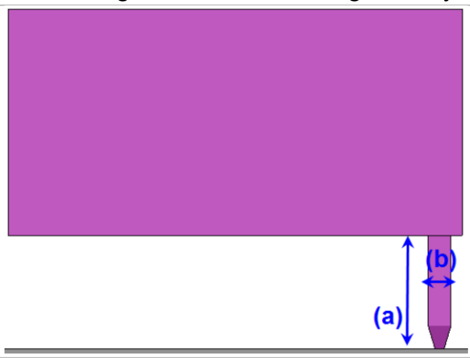


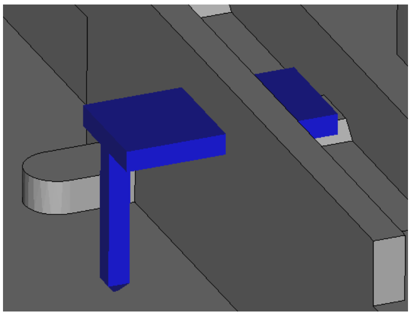

### 3.5.3 Label Tags

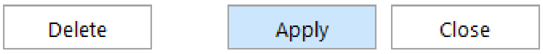
This feature allows you to connect a label tag at a part. You need to identify on the part where the label tag must be placed; just click on desired location on the part, and a preview of the label tag will be shown in BLUE color. To select a preview, just click on it, and it will become GREEN. Since the tag is not yet generated, you are still able to:

- Edit the parameters. Hold CTRL key to select multiple previews and edit them at the same time.
- Translate selected preview(s) by holding Shift key.
- Delete selected preview(s) by pressing Delete key.



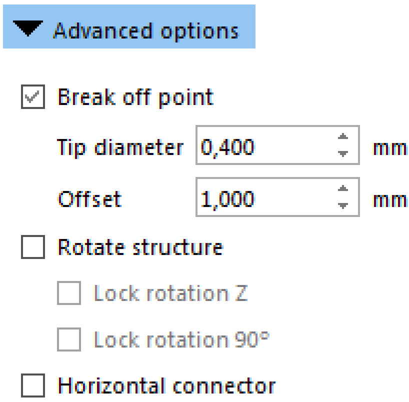

| | |
|---|---|
| Choose tag | This shows a library with unit tags which can be used to create label tags. |
| Create tag | Create a new tag out of part that is selected on the scene. This part can contain label planning information; this will be saved together with the part for fast editing once adding this tag to a part.<br>The tag will be automatically saved as a *.matPart file in the Label Tags library. |
| Load tag | Import an existing *.matPart file and add it to the Label Tags library. |
| Delete tag | Remove the selected tag from the Label Tags library. |
| Connector Length (a) and Connector thickness (b) |   |

| | |
|---|---|
| Detect Unwanted Intersections | The possibility exists that an unwanted intersection is created. Magics will detect this and give a warning.  *Label tag preview in blue* |
| As separate STL | The generated tag will become a separate part on the Part list. |

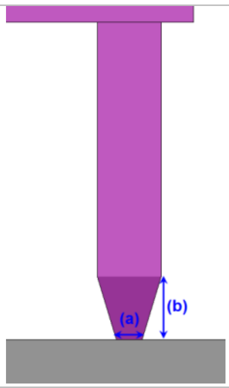
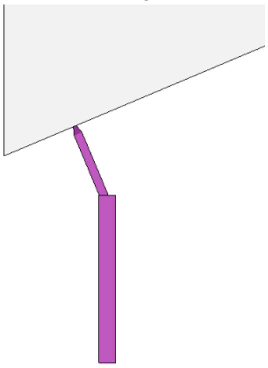
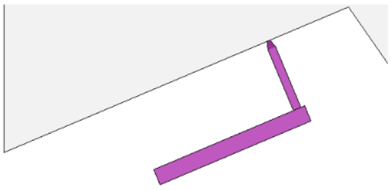
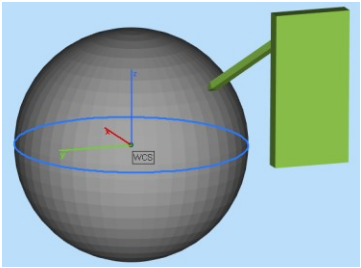
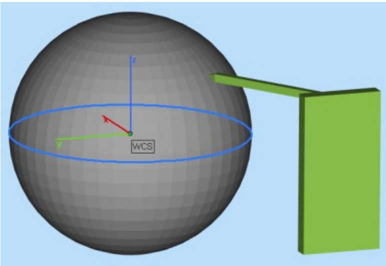



| | |
|---|---|
| Delete | Remove the selected preview(s). |
| Apply | Convert the preview(s) to STL and boolean it to the part. |
| Close | Close the dialog. |

### *3.5.3.1 Advanced Options*

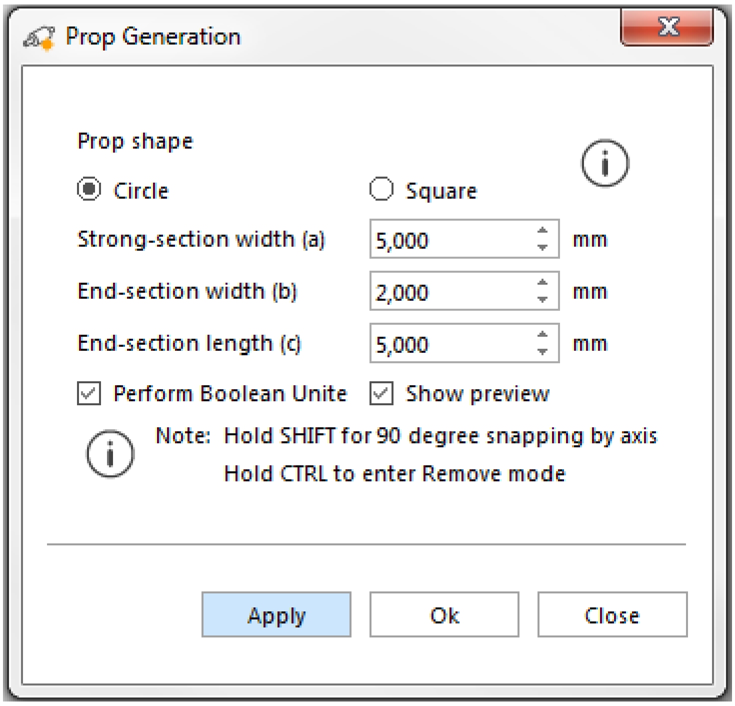


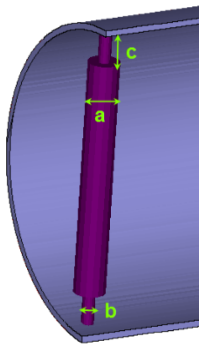

| | | |
|---|---|---|
| Break off point | Tip Diameter (a) | |

| | | |
|---|---|---|
| | Offset (b) |  |
| Rotate structure | The label tag will be rotated perpendicular to the selected surface.<br><br>*Not rotated* | <br>*Rotated* |
| | Lock Rotation Z | The label tag is always and only rotated into the Z direction. |
| | Lock Rotation 90° | The label tag is always and only rotated with steps of 90°. |
| Horizontal connector | OFF = the preview is placed on the part<br> | ON = the preview is placed on the part, with the connector parallel to the XY plane<br> |

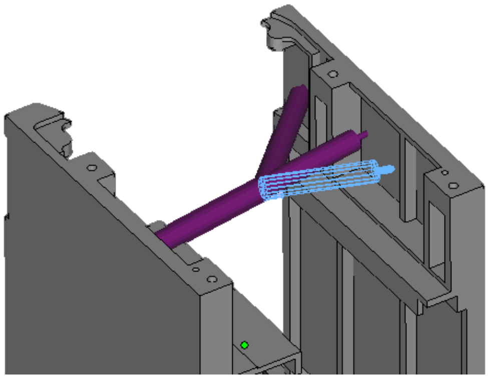
## 3.5.4 Prop generation

Prop Generation To avoid distortion on your part during building you can create 'props' to make sure that the shape of the part is kept.




| | | |
|---|---|---|
| Add | When clicking add, the prop can be drawn on the part, but it's not yet created. To have a better look where the prop will be placed a preview is shown (Advanced) | |
| Prop Shape | Circle/ Square | |
| | The shape of prop of this cross section can be changed between a circle or a square. | |
| Strong- section width (a) | The width of the circle/ square connector |  |
| End- section width (b) | The width of the connection (in between the strong section and the part) | |
| End- section length (c) | The length of the connection between the strong section and the part. | |

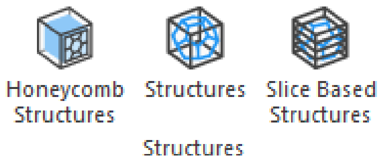
| | |
|---|---|
| Perform Boolean Unite | The part and prop(s) are united into one file and all surfaces are trimmed to make one shell of both parts. |
| Show Preview | While adding the props a preview is created of how the prop will be placed on the part |

| | |
|---|---|
| |  |

| | |
|---|---|
| Hold SHIFT for 90° snapping | After indicating the prop's starting point, holding SHIFT will make sure the generated props are straight (aligned to the world coordinate system, not locally) |
| Hold CTRL to enter Remove mode | Hold CTRL and click unapplied props to remove them. |

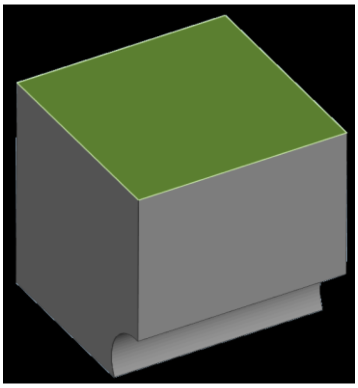
*Remark*: After creating the prop, it will be merged together with the part.

## 3.6 Structures

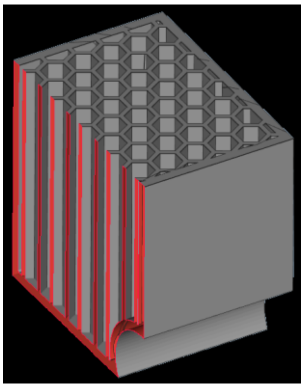



### 3.6.1 Honeycomb Structures

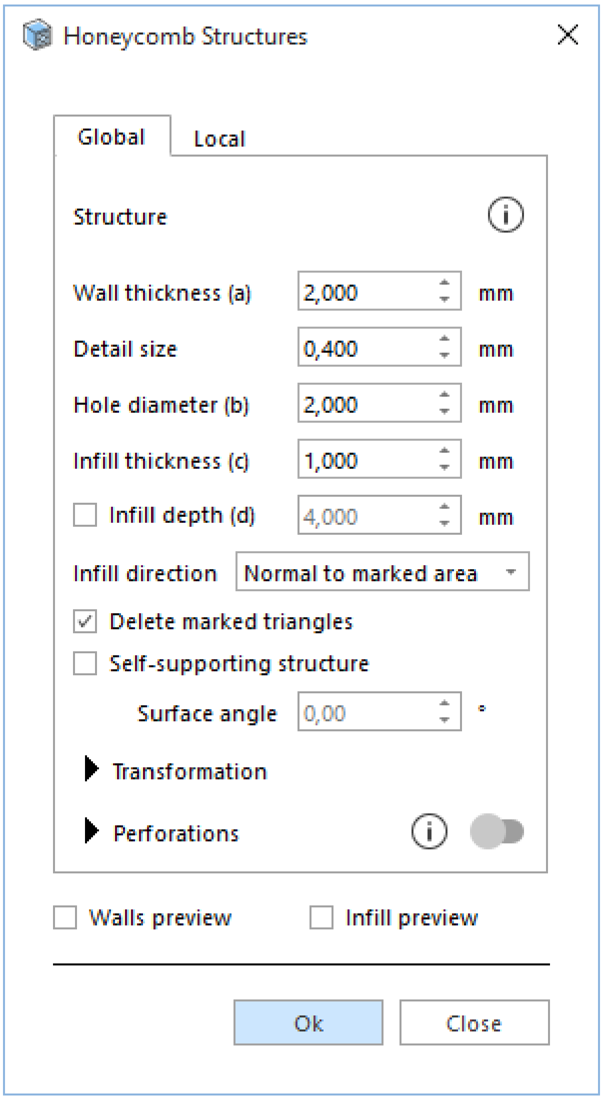

With this command you can easily create a hollowed part filled with a honeycomb structure; by marking the desired surface, an open side can be created to remove trapped material. The operation is similar to the traditional hollowing, where material is removed from the original part; the final printed part will become lighter, allowing you to save material and build time. In addition, the generated honeycomb structure will let you keep maximal part strength and functional use.



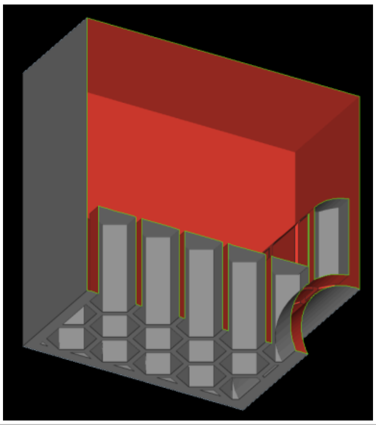
Original part with marked surface to be removed



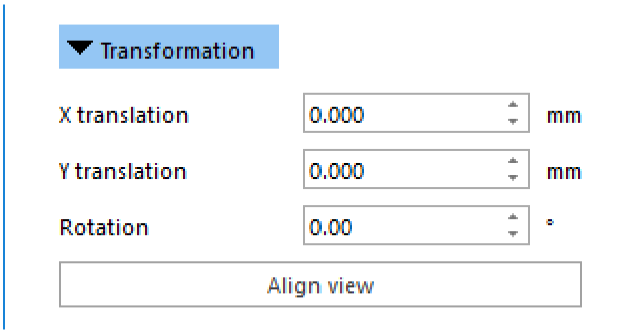
Resulting part with honeycomb structure generated




| | |
|---|---|
| Global/Local | When selecting “Global”, the honeycomb structure will be applied to the full part. |

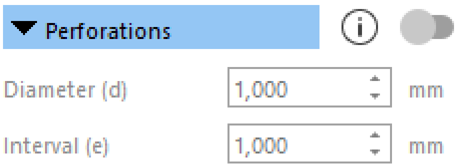
| | | |
|---|---|---|
| | When selecting “Local”, the honeycomb structure will only be applied to the marked area. | |
| Wall Thickness (a) | This value displays the distance over which the triangles of the original shell get an offset in order to generate a hollow part. | |
| Detail Size | This value displays the level of detail that will remain in the new shell. Standard, this value should be the same as the smallest detail of the part. The smaller this value, the more triangles will be included in the new shell and the more detail can thus be incorporated.<br>*Remark:* If the value is chosen too high, it is possible that the internal wall intersects with the external wall. | |
| Hole diameter (b) | This value corresponds to the distance of the opposing corners of the hexagonal hole profile of the honeycomb structure. | |
| Infill thickness (c) | It’s the thickness of the walls between the hexagonal holes of the structure. | |
| Infill depth (d) | Enable the honeycomb structure to be generated only for a specified depth in the part. The depth will be calculated as an offset from the part surface along the infill direction selected.<br> | |
| Infill direction | Select the direction that the hexagonal holes will follow when being generated. | |
| | Normal to marked area | The direction of the hexagonal holes corresponds to the average normal of the marked surface area. |
| | User defined | The direction is defined by a vector: fill in the coordinates in the X, Y and Z field.<br>Note: You can also click the Indicate line button and afterwards click on a line: the infill structure will be in the direction of the line. Otherwise, by clicking the Indicate triangle button and afterwards clicking on a triangle, the infill structure will be in the direction of the normal of the selected triangle. |
| Delete marked triangles | When this option is selected, the marked surface will be deleted to create an open side of the part. | |
| Self-supporting structure | When this option is selected, the resulting honeycomb structure will be self-supporting, without the need to generate support in a later moment. | |
| | Surface angle | This value defines the self-supporting angle used to generate the infill, making sure that no support is needed to build the part successfully. |

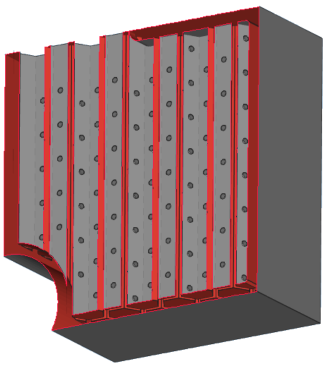
## — Transformation




| | |
|---|---|
| X translation | Move the honeycomb structure along the X axis of the structure coordinate system |
| Y translation | Move the honeycomb structure along the Y axis of the structure coordinate system |
| Rotation | Rotate the honeycomb structure around the Z axis of the structure coordinate system |
| Align view | Click on this button to align the viewport to the structure coordinate system; this makes it easy to understand how the structure will be translated/rotated |

## — Perforations




<table>
<tr><td rowspan="3">Perforations (toggle switch)</td><td colspan="2">Add circular perforations to the infill walls to further drain the material that might be trapped in closed areas of the honeycomb structure.<br></td></tr>
<tr><td>Diameter</td><td>The size of the perforation.</td></tr>
<tr><td>Interval</td><td>Distance between 2 consecutive perforations.</td></tr>
</table>

— Preview


User can now see the preview of the walls and/or of the infill of the honeycomb structure that will be generated. This will guide the user during the definition of the structure parameters.

The preview can also be used in combination with Multi-section in order to inspect the part inside, and how the structure will be generated.

### 3.6.2 Structures

More information can be found in the Structures chapter.

— See Create Structures Dialog, page 458

### 3.6.3 Slice based structures

More information can be found in the Structures chapter.

— See Create Slice-based structures dialog, page 464

## 3.7 Fit 2 Ship


### 3.7.1 RapidFit

More information can be found in the RapidFit module itself.

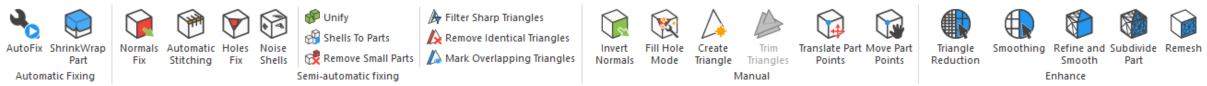
— See RapidFit, page 754

### 3.7.2 FormFit

FormFit More information can be found in the Create packaging module itself.

— See FormFit, page 751

# 4 Chapter 4: Fix




## 4.1 Automatic Fixing

### 4.1.1 Auto Fix

 Clicking on Auto Fix will perform the fixing operation automatically.

### 4.1.2 ShrinkWrap

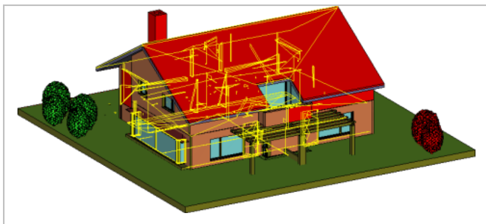
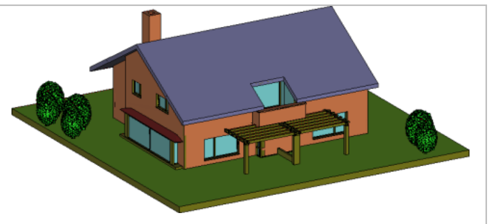
 Until a while ago, you were able to fix almost all files with the fixing tool pages and/or the “traditional” fixing tools of Magics. This because mainly all parts were designed with engineering CAD-programs (like Catia, UG, etc…) by people that knew that the drawing of the part was going to be used to produce the part, so the quality of drawing is pretty ok. At the moment, a complete new application is entering the RP-market. People do want to produce parts from 3D-drawings that were primarily drawn for visualization-purposes (E.g., Architecture, gaming industry, etc.…). This results in a complete different STL with complete different kind of errors where the Magics’ traditional fixing tools are not offering an efficient solution.

So we developed a fixing tool to repair these parts.

#### *4.1.2.1 Principle*

The principle is that a new surface is wrapped around the existing geometry so it takes over its shape and then the original geometry is removed. You can compare it with the real life shrink-wrapping, were plastic is wrapped around a part and shrinked to fit.

The main aim for the shrinkwrap is to make a part buildable, accuracy is the second priority.

| | |
|---|---|
|  |  |
| Part before being shrink-wrapped | Shrink-wrapped part |

### *4.1.2.2 When to use ShrinkWrap?*

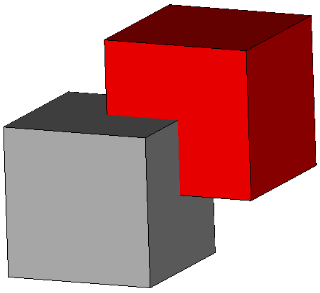
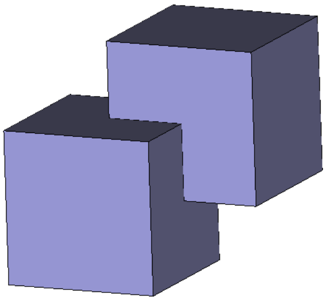
If the STL-file contains following kind of errors, consider using the ShrinkWrap to fix the part.

- *Complex inverted surfaces*: Inverted surfaces are so complex that automatic or manual flipping of the triangles is almost infeasible.
- Shells
- High shell count: Due to the way of drawing, the amount of shells can be very high. Then it's getting difficult for Magics to fix handle this amount of shells. For example, each beam of a windowframe is a separate shell and the building has a few hundred windows.
- Many of those shells are touching and/or coming together at the same spot, resulting in many triangle sides on exact the same spot. This confuses the traditional fixing algorithms because he cannot determine which triangle is connected to which triangle.
- Internal shells: Some models contain a lot of internal shells that are not necessary for building the part. Due to the nature of the part, it's difficult to isolate these shells for an efficient removal.
- Complicated bad edges: The bad edges are so complex that stitching, hole filling or the creation of triangles does not help.
- Gaps
- The elements of the part are not properly connected to each other. There's sometimes a small gap between the parts.
- Single surfaces
- Some sides are represented by single surfaces having no thickness. This is ok for visualization but not for building on a RP machine.

### *4.1.2.3 How does ShrinkWrap fix these problems*

#### 4.1.2.3.1 Flipped triangles

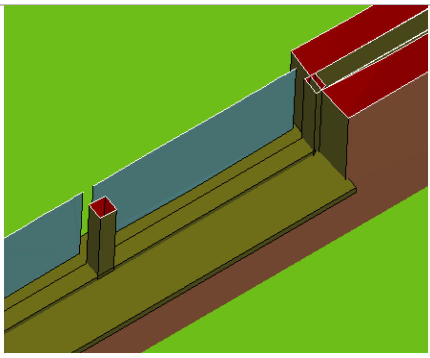
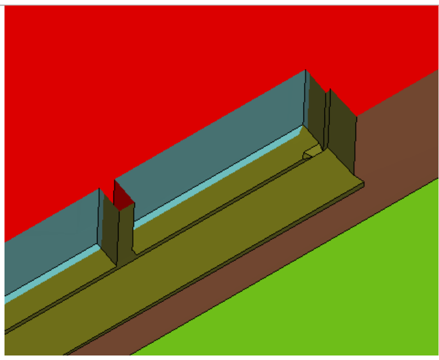
The ShrinkWrap algorithm will lay the surface on triangles, regardless their orientation.

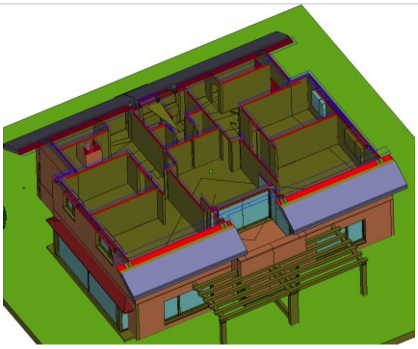
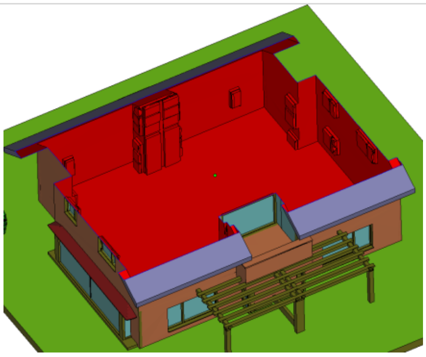
| | |
|---|---|
|  |  |
| Before | After |

### 4.1.2.3.2 Outer geometry

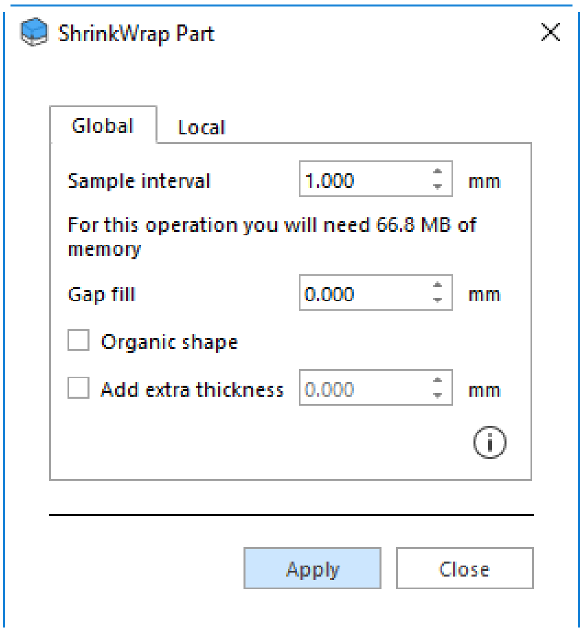
The Shrink-wrapped surface will

- Only take the outer geometry in account
- Joining all the shells (and so handling overlapping & double surfaces)
- Ignoring inner geometry, noise shells and their errors (complex bad edges)
- Treat single surfaces (surface with no thickness) as outer geometry
- Bridge small gaps
- Bad edges very close to each other
- Different shells not joined properly

<table>
<tr><td></td><td></td></tr>
<tr><td>This contains<br>— Single surfaces (the window)<br>— Overlapping Multiple shells<br>— Gaps between beam & Window</td><td>Shrink-wrapped<br>— Single surface is seen as outer geometry<br>— Only the outer geometry of the shells is kept<br>— Small gaps are bridged</td></tr>
</table>

| | |
|---|---|
|  |  |
| Many internal features inside the house | All internal features are removed.<br>Only the outside is kept. |

### 4.1.2.4 Dialog Box and its parameters




#### 4.1.2.4.1 Sample Interval:

The smaller, the more precise the Shrink-wrapped surface will follow the original geometry.

Please consider:

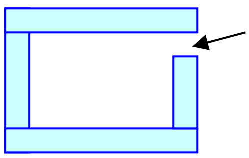
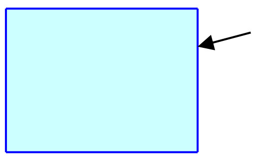
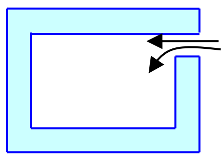
- The smaller the sample interval, the higher the memory usage. Because we're dealing with an object in 3D object, a division of the sample interval by 2 will increase the memory use by 8 (each dimension gets 2 times more samples → 2*2*2=8).
- The smaller the sample interval, the more details will be preserved. Details that fall between 2 sample points (E.g. small walls, ribs, decorations, etc…) typically fall away. (see below "Wall thinner than…")
- The smaller the detail, the more sensitive the Shrink-wrapped surface is for gaps and the surface might "leak" to the inside via a gap. To compensate this, use Gap Fill.

Sometimes sharp edges are not followed perfectly. This can happen into areas with a high complexity.

#### 4.1.2.4.2 Relation between Sample interval & Gaps.

The surface will fill small gaps and holes.

But if you use a smaller sample rate, the accuracy of the wrapped surface will increase. It might increase so much that the gaps will be considered as geometry and these defects will be shrink-wrapped. The result is that the surface might “leak” to the inside so that all internal geometry will be shrink-wrapped too and there’s also the risk that walls might disappear because they are too thin. If this is the case, use “gap fill” to compensate.

| | | |
|---|---|---|
|  |  |  |
| Original Geometry | ShrinkWrap low accuracy<br>The Gap is bridged | ShrinkWrap High Accuracy<br>So accurate, the gap is seen as geometry and the surface “leaks” to the inside. |

### *4.1.2.5 Walls thinner than … might disappear*

Depending on the sample interval, geometry thinner than the given thickness might disappear. This might be a problem with walls & pipes from architectural parts.

Keep in mind that only geometry will disappear that is shrink-wrapped at both sides. Thin walls on the outside of a house, where the inside is not wrapped will not disappear.

How to deal with this:

- Use “Add thickness” to avoid removal of this geometry (see below)
- Try to detect the thin areas (use double surface detector)
- Try using offset to make them thicker

Try to separate these thin areas from the main part & process these parts separately.

### *4.1.2.6 Sample Data to process*

This gives you an indication of the size of the 3D Sample data.

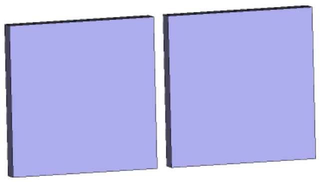
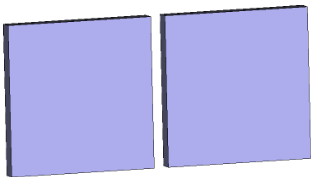
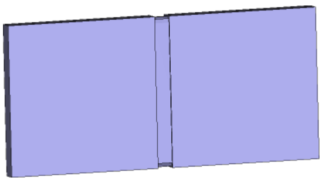
Please keep in account that this is not the final memory usage.

Pay attention because the algorithm is also needing memory to create the triangle surface around the part (the ShrinkWrap surface) and (depending of the complexity of the geometry) this can also need a lot of memory.

### 4.1.2.7 *Advanced Parameters*

#### 4.1.2.7.1 Gap fill

If you notice that there are still gaps that need to be filled, you can increase the gap filling rate with this function.

| | | |
|---|---|---|
|  |  |  |
| Original geometry | S.W. without Gap fill | S.W. with Gap fill, the hole is filled |

#### 4.1.2.7.2 Organic shape

If you have a part with a shape without essential edges, you can skip the step of restoring these by checking “Organic shape”. This will also save you time.

#### 4.1.2.7.3 Add extra thickness

If the part contains features that are too thin, checking this checkbox will add extra thickness.

Please take in account that:

- The thickness will be added to the whole part
- The thickness has a minimal value, depending of the ShrinkWrap parameters.

You can use Add extra thickness

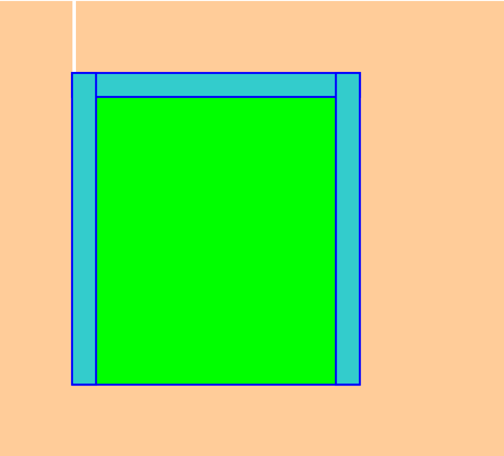
- To avoid that geometry disappears because it’s too thin
- To add thickness to the part to make it build able

#### 4.1.2.8 Working with the ShrinkWrap

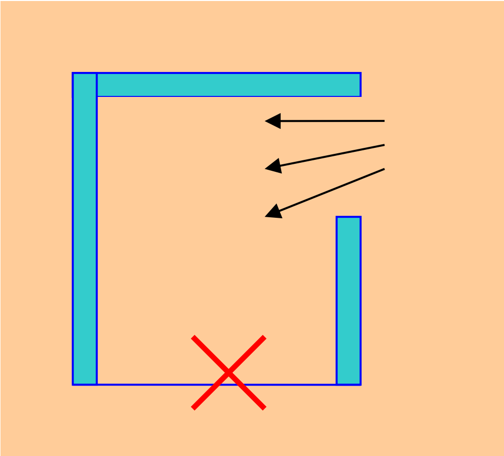
- Please take in account the high processing time & memory use of this algorithm. Some parts are still faster & more accurate to fix with the Fixing Wizard.
- The ShrinkWrap algorithm should be considered as a step in the fixing process. You need to prepare the model. You can check if the model is "closed" so that the outside is not leaking to the inside. If this happens, the risk that geometry will disappear because the walls are too thin is very high. You can close the model using hole filling, creating triangles or by extruding sides of walls.

Below is an example what might happen if you don't prepare a part properly.

- Red: outside
- Green: Inside



Part is closed properly.
The result is that the "outside' stays at the outside and the result will be a solid block.



A gap is not closed
The "outside leaks inside".
This results also in the thin wall that will disappear.

- You can run some quick test to see if the part is shrink-wrapped correctly by using the add thickness option.
-

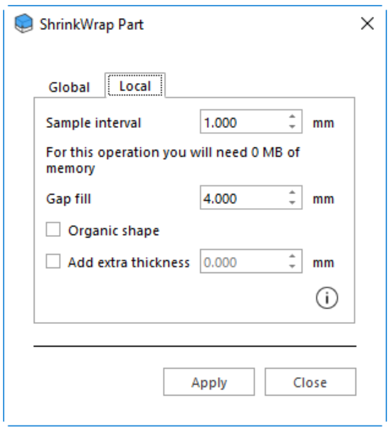
When using add Thickness, some steps are skipped what gives you faster feedback so you can have an idea of the end result or an indication where it goes wrong

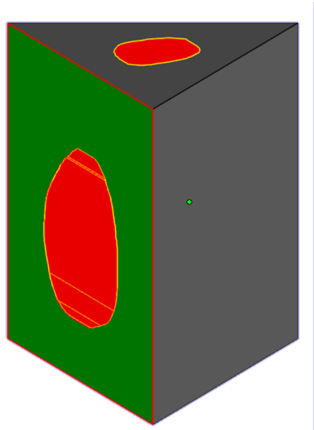
#### 4.1.2.9 Local ShrinkWrap

The user can also perform a Local ShrinkWrap, which means that the ShrinkWrap operation will be applied only on an indicated area. The Local Shrinkwrap is located in the ShrinkWrap Part dialog box, under the 'Local' tab.

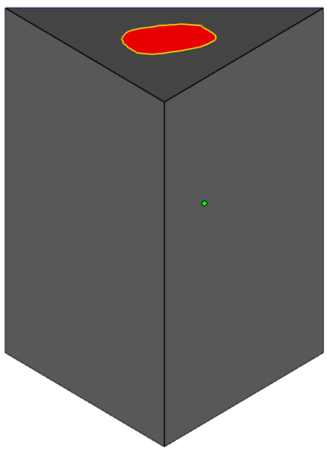
In order to mark the surface and, implicitly, the triangles on which the Local ShrinkWrap will be applied, use the already available marking tools from the marking toolbar.

After marking the area, open the ShrinkWrap window, switch the tab to “Local” and indicate what parameters should be used. For further details on the parameters, please read again through sections 4.1.2.4 Dialog Box and its parameters & 4.1.2.7 Advanced Parameters.



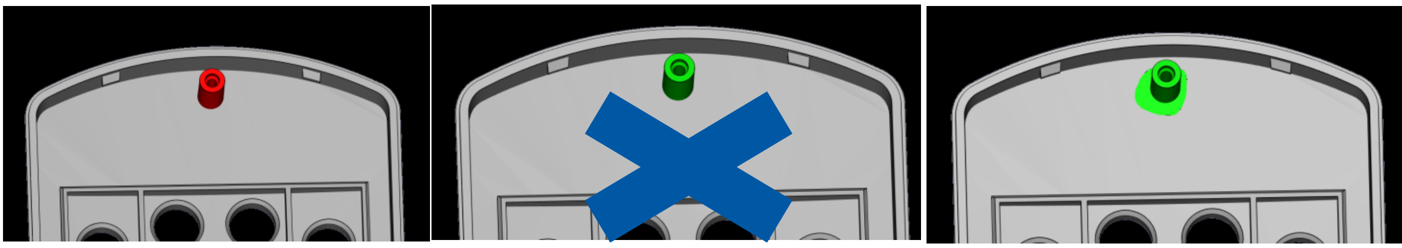
The Local ShrinkWrap will be applied on the surface that you have selected and will create an organic tie between this surface and the rest of the part.



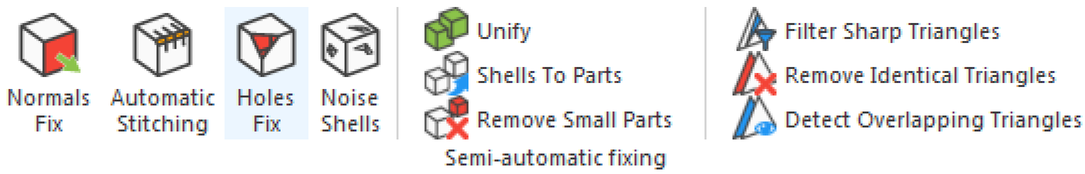
The Local ShrinkWrap operation might encounter issues if:

- The selection is a shell that is made out of inverted triangles

*Solution:* When selecting, use a marking tool that allows you to select also non-inverted triangles around the shell made out of inverted triangles



## 4.2 Semi-Automatic Fixing




### 4.2.1 Normals Fix

This option allows you to automatically fix inverted normals on the selected part(s).

— See Inverted Normals, page 415.

### 4.2.2 Automatic Stitching

This option allows to automatically stitch near edges on the selected part(s). Magics will do an estimation of the needed tolerance and stitch iteratively using this tolerance.

— See Bad edges, page 415.

### 4.2.3 Holes Fix

This option allows to automatically fix holes on the selected part(s). When pressing the button, all the detected planar holes will be filled. A planar hole will not be filled with triangles if Magics detects that these new triangles will intersect with other (existing) triangles.

After the hole filling, check if the holes are filled correctly. It can be that the geometry was misunderstood.

— See Planar hole, page 416.

### 4.2.4 Noise Shells

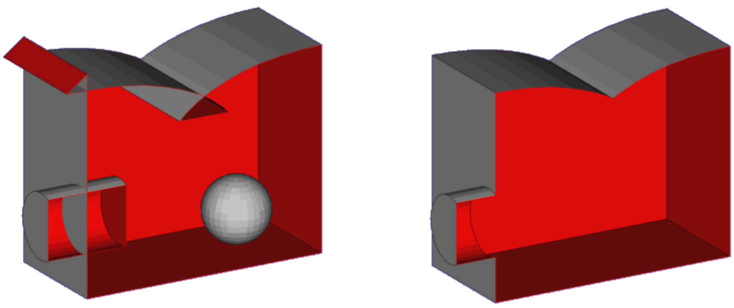
This option allows to automatically remove noise shells from the selected part(s). We prefer to play it on the safe side. Occasionally the algorithm does not remove some noise shells.

— See Noise shells, page 418.

### 4.2.5 Unify

When applying the unify function to a part, only the outer triangles will be preserved and all the inner triangles will be thrown away.

Example:



You see there are 4 changes:

- Sphere: The triangles of a sphere are all internal triangles, so they are removed.
- Cylinder: The cylinder intersects the cube. As you see, only the triangles that are outside remain. The internal surfaces are removed after a re-triangulation was done.
- Overlap: the internal part of the intersection is removed.
- Intersection at the outside: Surfaces, which are inverted, are removed.

For parts with a lot of internal intersections, unify will help you to make clean parts.

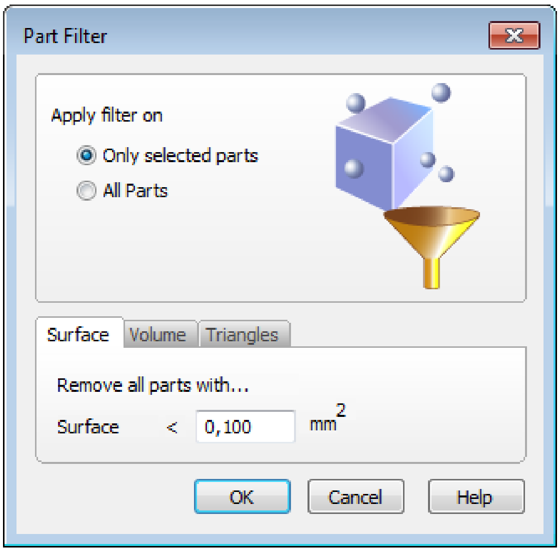
### 4.2.6 Shells to parts

Converts shells to parts.

— See Shells, page 417.

### 4.2.7 Remove Small Parts

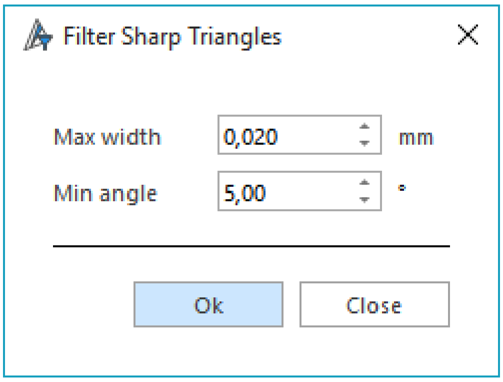
When doing a Shells to Parts (See Shells, page 417), the result may be a lot of small parts, which are just noise and which are not needed anymore. You can define yourself what you consider as small. The Small Part Filter will remove these small parts. You can choose to remove all small parts, or only the selected.




| | | |
|---|---|---|
| Filter | Only on selected parts | The selected parts that fulfil the conditions set in Surface, Volume or Triangles. |
| | All Parts | All parts that fulfil the conditions set in Surface, Volume or Triangles. |
| Surface | Parts with a surface area smaller than the defined one are removed, following the condition set in Filter. | |
| Volume | Parts that are smaller than the defined volume are removed, following the condition set in Filter. | |
| Triangles | Parts that contain fewer triangles than the defined amount are removed, following the condition set in Filter. | |

### 4.2.8 Filter Sharp Triangles

When the part has long thin triangles, this filter will remove them.




— The parameters used for this command are synchronized with the ones in Triangle tool page: See Triangle page, page 427.

### 4.2.9 Remove Identical Triangles

 This tool gives you the opportunity to remove identical triangles quickly. Two parameters define when two triangles are considered identical.

— The parameters used for this command can be found in Triangle tool page: See Triangle page, page 427.

### 4.2.10 Mark Overlapping Triangles

 This tool allows you to detect overlapping triangles (double surfaces). The definition of an overlapping triangle is made with the help of some parameters.

— The parameters used for this command can be found in Triangle tool page: See Triangle page, page 427.

## 4.3 Manual

### 4.3.1 Invert Normals

 Click to activate. You can now manually invert all the marked triangles.

### 4.3.2 Fill Hole mode

 Click to activate. You can now manually select and fill holes.

— See Single or Multi-contour hole, page 423.

### 4.3.3 Create Triangle

Click to activate. You can now manually create a triangle or bridge.

— See Create triangle, page 424.

### 4.3.4 Translate Part Points

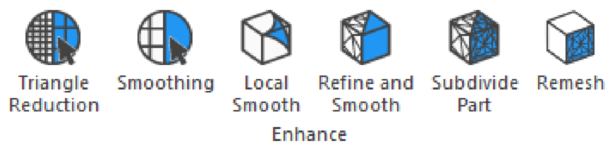
Click to activate. You can now manually select and translate a part point. Select multiple points by holding CRTL while selecting, or by drawing a window.

— See Translate, page 191

### 4.3.5 Move Part Points

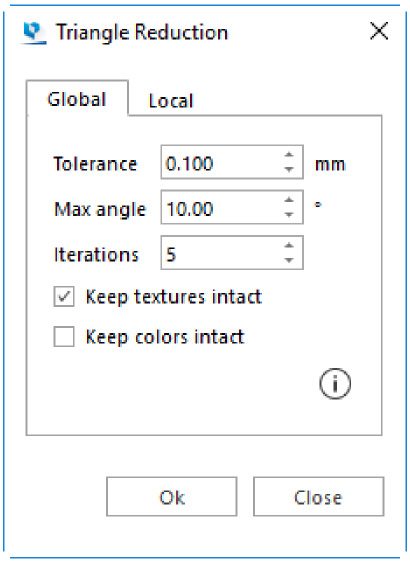
Click to activate. You can now manually select a part point and replace it. This point will snap to the neighboring edge or points

## 4.4 Enhance




### 4.4.1 Triangle reduction


Magics allows you to reduce the number of triangles in an STL file. This makes it easier to manipulate the file. You can re-triangulate the whole part, or only a selected portion. A Local Triangle Reduction will reduce only the marked triangles, but some neighboring triangles can be changed too.



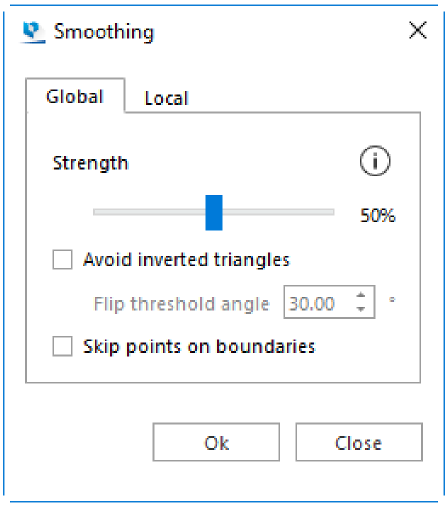

| | |
|---|---|
| Tolerance | If 2 triangles are replaced by one triangle, there may be a little deviation in position. The tolerance indicates the maximum deviation allowed between the original surface and the new one. |
| Max angle | The Max angle value defines two limits:<br>— When two triangles have an angle value bigger than Max angle, they may not be reduced. The edge between them may not be eliminated; otherwise too much geometrical information would be lost. When the program meets such an edge, the reduction will keep the edge but reduce the number of points on it.<br>— When there is no critical edge, this Max angle value determines the maximum angle that can be created during the reduction. This means where there is an edge present, there will remain one. Where there is no edge, no edge will be added. |
| Iterations | Magics can perform the operation in different iterations to improve the reduction of triangles. It is better to increase the number of iterations than performing the triangle reduction twice (to maintain the smallest detail). |
| Keep textures intact | Textures on the part stay intact. Some triangles may not be filtered out due to texture that is kept. |
| Keep colors intact | Colors on the part stay intact. Some triangles may not be filtered out due to color that is kept. |

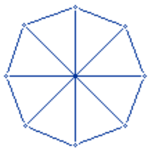
*Remark*:

— It is advised not to use the reducer on very noisy objects. In this case it is better to perform a smoothing first.
— If the tolerance and angle values are too big, essential part information may get lost.

### 4.4.2 Smoothing

Smooth the selected part or marked area.

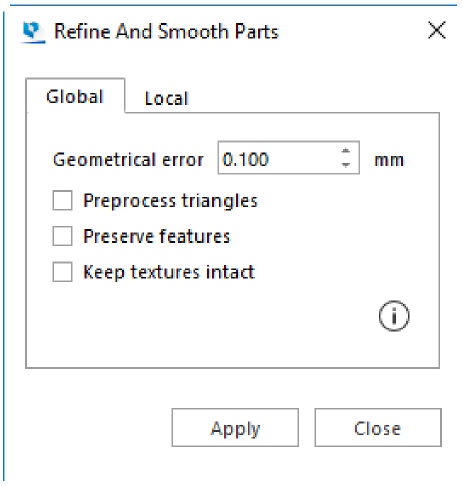



| | |
|---|---|
| Global / Local | Global will smooth the whole part. Local will smooth only the selected triangles. |
| Strength | We will explain this factor with the figure below. The figure shows eight triangles with one common point in the center.  The algorithm changes the position of this center point according to the positions of the eight other points. The importance of the other points can be raised or lowered by adjusting the Ratio-parameter. If this Ratio is low (0.01) the new position is mainly dependent on the old position of the point. If this ratio is 1, the dependency is spread over the points. The new position is still 50% dependent on the old position. With high values for the ratio, the new position is mainly determined by the position of the other points of the triangles. In this last case it is obvious that we talk about smoothing. This algorithm is exercised on every point of the part. |
| Avoid Inverted Triangles | To avoid the creation of flipped triangles, the movement of the points will be aborted when the angle between the normal of the neighboring triangles is bigger as the given angle. |

| | |
|---|---|
| Skip points on boundaries | When the point is on the part boundaries edges (with Global option) or on the marked area boundaries edges (with Local option), the point won't be moved. |

### 4.4.3 Refine and Smooth Parts

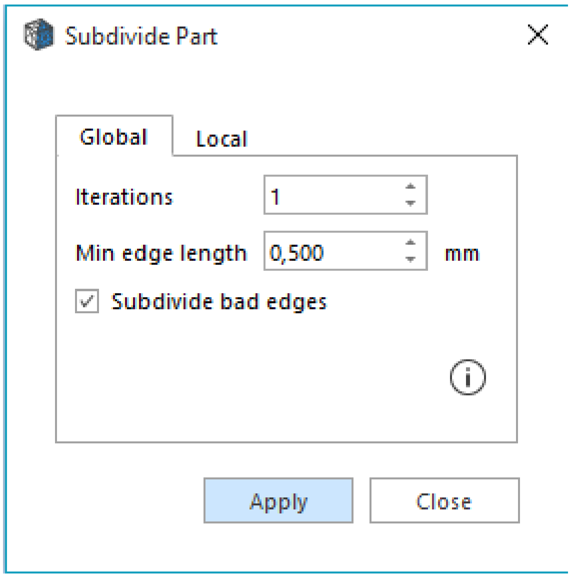
This feature has as purpose to give gaunty parts a more smooth surface while making sure that the original shape is maintained as much as possible.

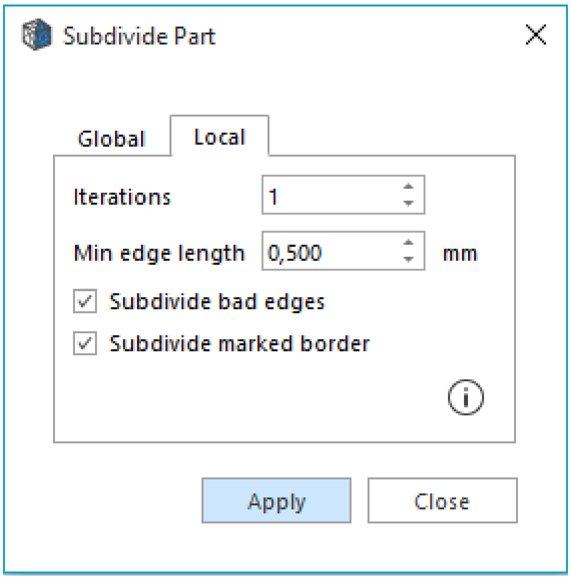



| | |
|---|---|
| Global / Local | Global will smooth the whole part. Local will smooth only the marked triangles. |
| Geometrical error | Geometrical indicates the maximum deviation allowed between the original surface and the new one. |
| Preprocess triangles | Before the refine and smooth algorithm is performed, a filtering of sharp triangles is done. |
| Preserve features | Sharp features will be preserved. The refine and smooth algorithm will only smooth the surfaces that are already pretty smooth. This makes sure that surfaces that don’t need smoothing will keep their geometry. |
| Keep textures intact | Textures on the part stay intact. Some triangles may not be smoothed due to texture that is kept. |

### 4.4.4 Subdivide part

With the Subdivide Part option, you can add extra triangles to the selected part or area without changing its appearance.

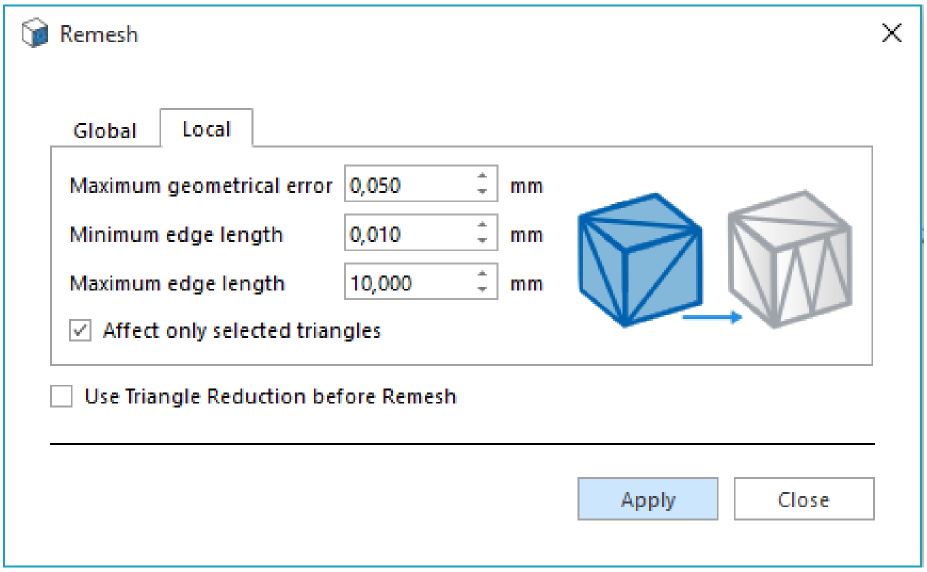


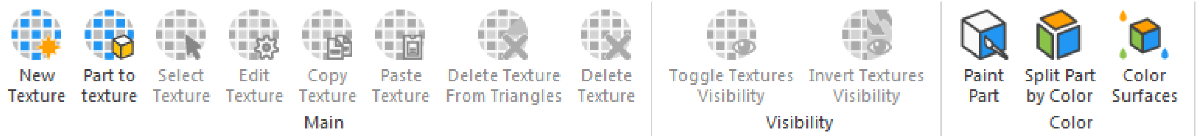

| | |
|---|---|
| Global / Local | Global will subdivide the whole part. Local will subdivide only the marked triangles. |
| Number of iterations | Number of iterations indicates the number of iterations that will be executed. The more iterations, the more additional triangles the will be added. The maximum number of iterations is 1,000 |
| Max edge size | Max. Edge Size indicates the maximum edge size that will be subdivided. |
| Subdivide Bad Edges | Bad edges will be subdivided. |
| Subdivide Marked Border | The border of the selected triangles will be subdivided. |

### 4.4.5 Remesh

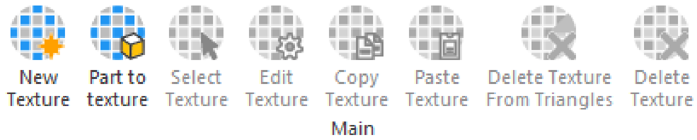
Remesh feature gives users a option to generate new mesh topology in frames of existing part. It can be applied to the whole part or marked region.


Remesh
Global
Local
Maximum geometrical error
0,050
mm
Minimum edge length
0,010
mm
Maximum edge length
10,000
mm
Affect only selected triangles
Use Triangle Reduction before Remesh
Apply
Close

# 5 Chapter 5: Texture




## 5.1 Main

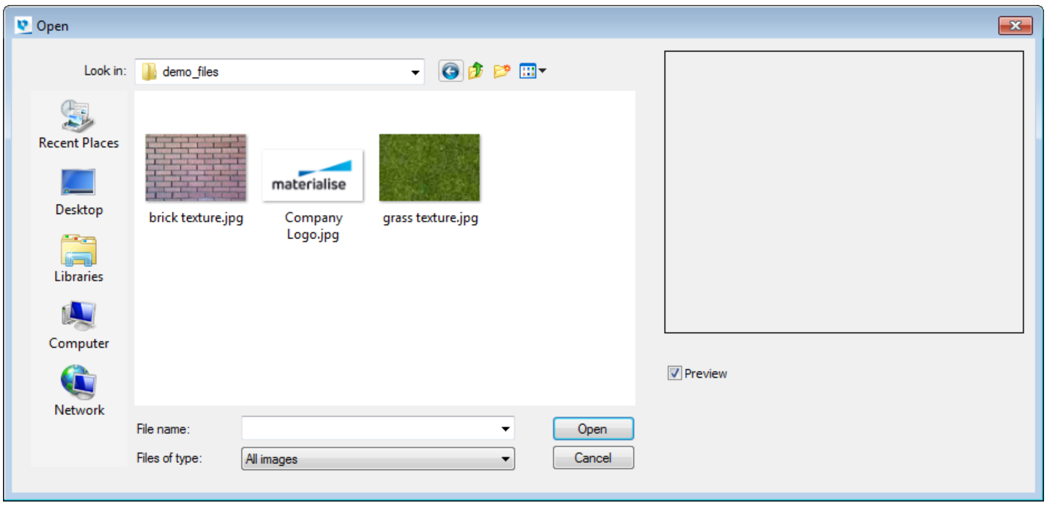



### 5.1.1 Select Texture

Select an existing texture in your design.

### 5.1.2 New Texture

Apply a new texture to a selected are or part.



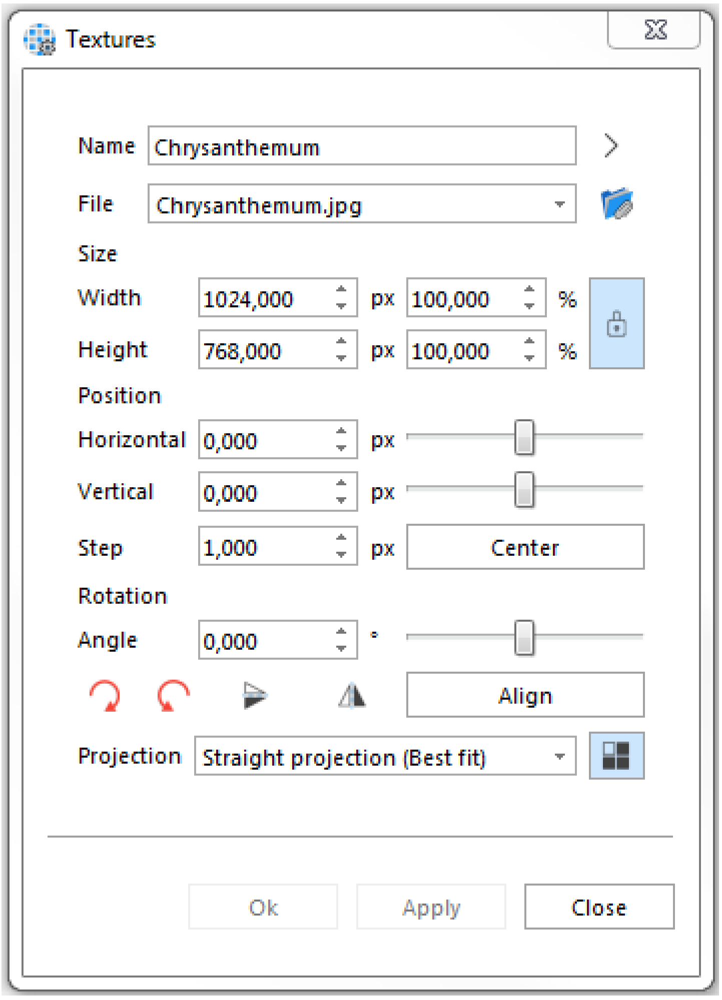
You can browse to images to use as a texture. Any image file type is allowed. Select the image you want to use and click ***Open***.

Next, the Textures dialog appears, allowing you to change the application of the texture.

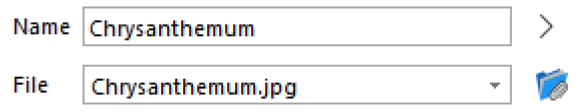
— See Edit Texture below.

### 5.1.3 Edit Texture


In the Textures Dialog you can change the used image, and adjust the usage and appearance of the selected texture image. After making the desired changes, click ***Apply*** to stay in the Textures dialog after applying the changes. Click ***OK*** to apply and close the dialog. Click ***Close*** to close the dialog without applying the changes.

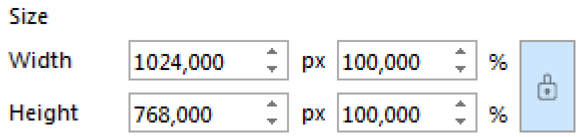


### 5.1.3.1 Texture




| | |
|---|---|
| Name | Name of the surface where the texture is applied to. By default the name of the texture file used, but can be changed. |
| Next Texture ( > ) | Click to go to the next texture on the selected part. |
| File | Shows the file used. You can select any other loaded texture from the drop-down menu, or load a new texture using the -button. |

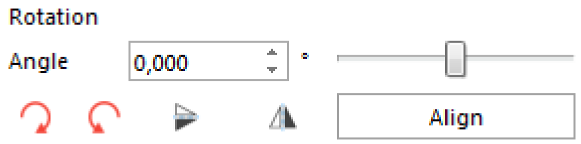
### 5.1.3.2 Dimensions




When applying a texture, the height and width of the loaded image is used. Change the units or the percentage by typing, or use the slider bar.

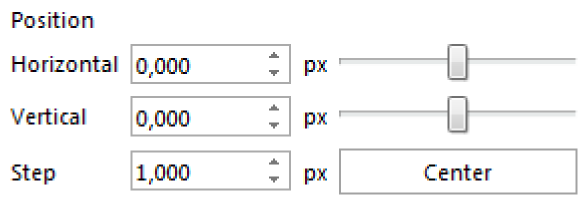
By default, the width/height ratio is locked. Click the -button to change width and height independently.

### 5.1.3.3 Rotation



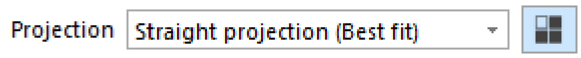

By default the rotation angle is 0 degrees. Enter a degree, or use the slider bar to interactively change the rotation. Align a texture to a specific edge by using the ***Align Wireframe*** button, then selecting the desired wireframe edge.

### 5.1.3.4 Position




Position allows you the change the actual placement of the image. By default, the image is centered. Use ***Y+, X-, X+, Y-*** to change the positioning, or use the slider bars. Click ***Center*** to center the image. Step lets you change the number of units that the position will be changed with each position change when using the buttons.

### 5.1.3.5 Advanced options




It is possible to align a texture to a specific edge by using the ***Align Wireframe*** button, and then indicating the desired wireframe edge.

Straight Projection is the most common option. For cylindrical objects, the Cylindrical Projection helps to map a texture with less distortion."

## 5.1.4 Update Textures

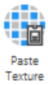
Updates textures of the selected part(s)

*<u>Remark:</u> more info about the status of the textures can be found in* Textures page*, page 447.*

## 5.1.5 Copy Texture

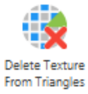
Copy a selected texture

### 5.1.6 Paste Texture



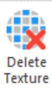
Paste a previously copied texture to a new area or part.

### 5.1.7 Delete Texture From Triangles



This option deletes the texture from selected triangles.

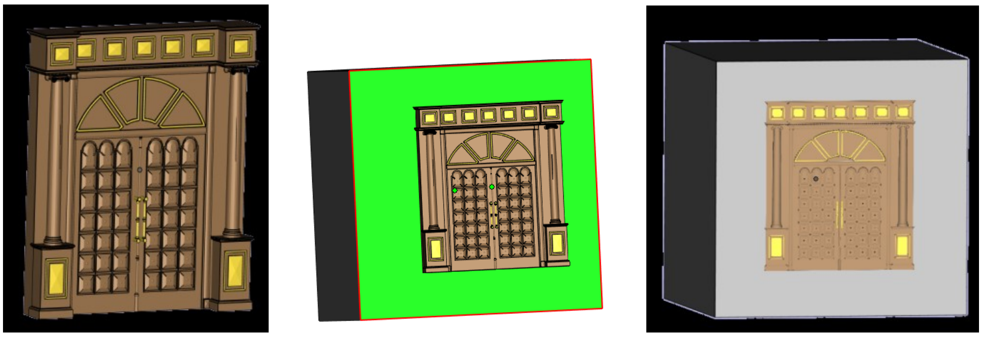
### 5.1.8 Delete Texture



This option deletes the texture of the selected part(s).

### 5.1.9 Part to texture

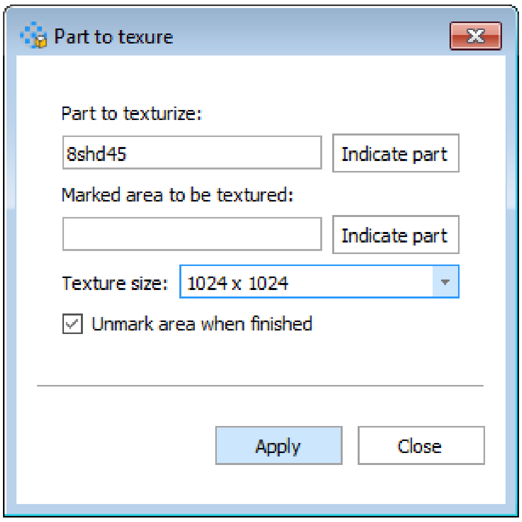
With this function, you can create a texture on a marked area by projecting another (textured) part onto that area. This can be useful when you want to preserve details that are too small or fragile to print.



For this operation, you will need two parts:

- The part which will be converted into a texture (part to texturize)
- The part onto which the texture will be applied (area to be textured).

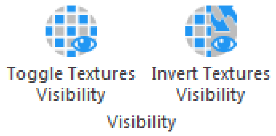
Position the part to texturize on top of the area you want to texture, mark the area, and open the function. Use the “Indicate part” buttons to fill in the correct parts and click “Apply” to perform the operation.




| | |
|---|---|
| Part to texturize | This part will be converted to a texture. |
| Marked area to be textured | This part should contain the marked area onto which the texture will be applied. |
| Indicate part | Click this button, then click a part to fill it in into the corresponding field. |
| Texture size | The bigger the texture size, the more detailed the texture will be, but the more time the operation will take. In general, the bigger the area you want to cover, the bigger the texture should be. |
| Unmark area when finished | The area needs to be unmarked to see the result, but if you want to re-use the marked area for another operation, this function can be disabled. |
| Apply | Perform the operation without closing the dialog. |
| Close | Close the dialog without performing the operation. |

*Remark:* The fastest way to use Part to texture is to already position the parts correctly, mark the desired area, selecting the involved parts and then activating the function. This way, the correct parts will be filled in automatically. If only one part is selected, it will be filled in as “part to texturize”.

## 5.2 Visibility




### 5.2.1 Toggle Textures visibility


Toggle the texture visibility on and off, allowing to view the design without the applied texture(s)

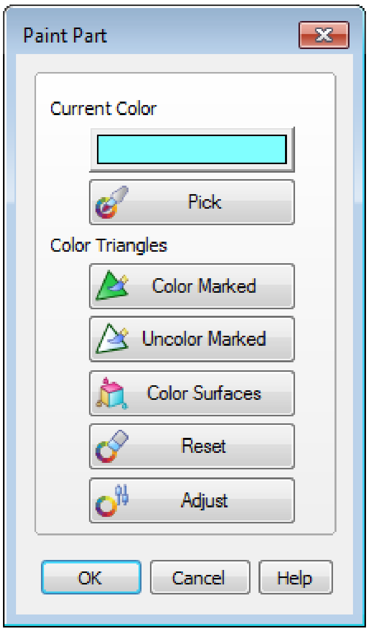
### 5.2.2 Invert Textures Visibility

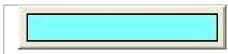
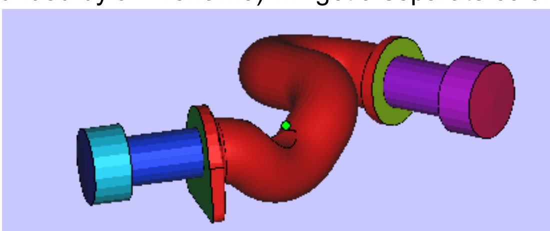

Inverts the texture visibility. If only one texture is used on a part, this function acts similar to the ***Toggle Textures Visibility***. If multiple textures are used, visible textures will be made invisible, and invisible visible.

## 5.3 Color


### 5.3.1 Paint Part


Parts and triangles can be painted. When you load a part it also has a color. This color is not a property of the part. It just acts like a background color to visualize the part. We call it the STL color. You can over paint this color with this paint function. When you use the paint functionality, the assigned colors can be saved if you save the part as 'STL (Colored)'.

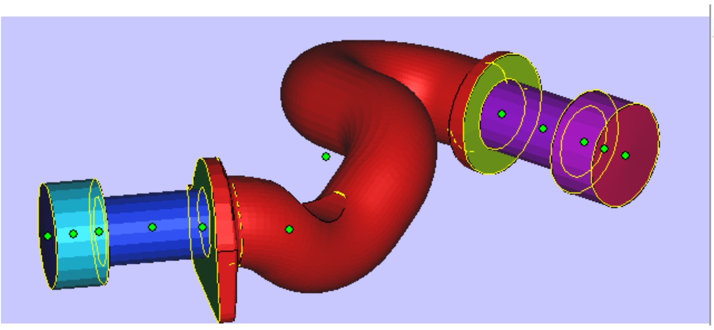



| | |
|---|---|
|  | A dialog pops up and a color palette opens. You can choose a color. We call this color the paint color. |
| Pick | If you want to change the paint color to a color of some triangles on the part, you can push the pick button and click on a triangle with the desired color, or pick a color out of a texture. It is also possible to pick a color from a color per vertex map. The paint color will become the picked one. |
| Color Marked | When you push the Color Marked button the marked triangles are painted in the paint color. |
| Uncolor Marked | When you push the Uncolor Marked button the marked triangles get their STL color. |
| Autocolor | With the Auto button, each surface (amount of triangles surrounded by a wireframe) will get a separate color.  |
| Reset | The Reset button erases the colors. The part will get the STL color. |
| Adjust | Enables the user to adjust the brightness, contrast and gamma of the color. |

### 5.3.2 Split part by color

Split Part by Color

All triangles with the same color will be split off the original and converted into a part. The new parts are listed in the part list.



| | Visible | Shading | Color | M... | Part Na... |
|---|---|---|---|---|---|
| 1 | | | | | Core |
| 2 | | | | | Core_1 |
| 3 | | | | | Core_22 |
| 4 | | | | | Core_23 |
| 5 | | | | | Core_25 |
| 6 | | | | | Core_26 |
| 7 | | | | | Core_29 |
| 8 | | | | | Core_30 |
| 9 | | | | | Core_31 |
| 10 | | | | | Core_32 |
| 11 | | | | | Core_33 |
| 12 | | | | | Core_34 |

### 5.3.3 Color Surfaces

Color Surfaces

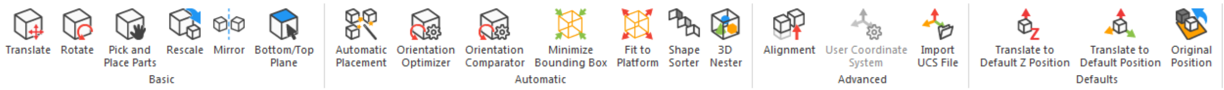
Apply a different color to each surface of the selected part(s).

### 5.3.4 Triangle Colors

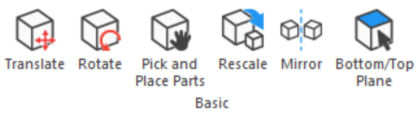
Triangle colors

Show/Hide the painted colors (triangle & vertex color) of the part(s) in the current scene.

# 6 Chapter 6: Position

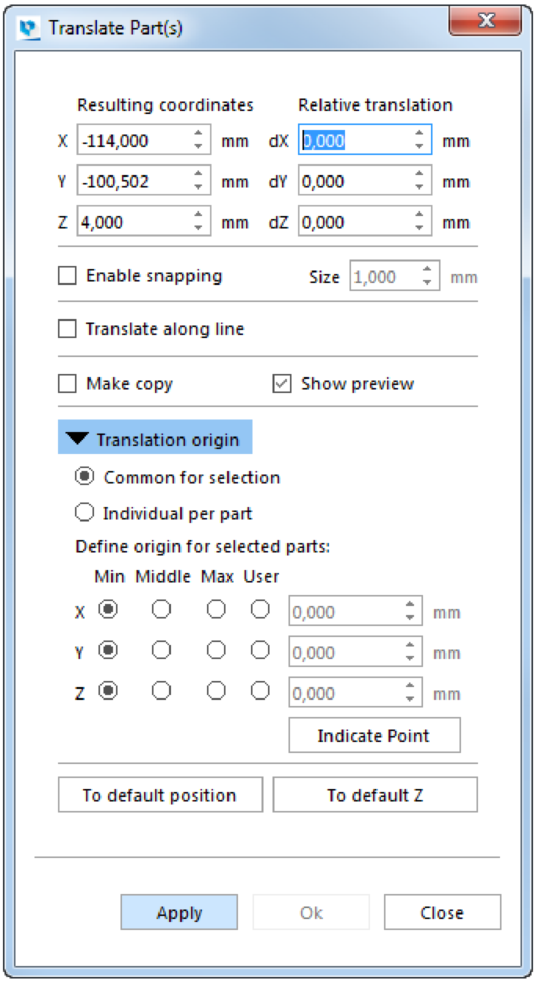



## 6.1 Basic



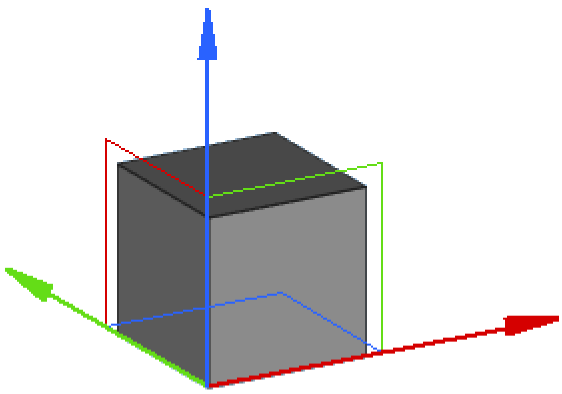

### 6.1.1 Translate


Move the selected part(s) interactively or by inputting values.




| | |
|---|---|
| Resulting coordinates | Use the resulting coordinates fields if you want to move a part to a specific location. |
| Relative translation | Use the relative translation fields if you want to move the part a specific distance away from the current position. |
| Enable snapping | Enable if you want to translate with specified intervals. (For example: only move per 1 mm.) You can use the snapping option both for interactive translation and with coordinate fields. |
| Size | The snapping value used. |
| Translate along line | After enabling, select a line (part/triangle edge) along which you want to translate. This function can only be used when translating interactively. |
| Make Copy | Enable if you want to make a copy on the desired place and keep the original part on its place. |
| Show preview | When enabled, a preview will appear to show the result of the inputted values. |
| Define origin for selected parts | Define the translation origin of the part to select which point of the part should be moved (to which point in space). |

| | | |
|---|---|---|
| | Multiple parts selected | - Common for selection: all parts will be moved around the same origin<br>- Individual per part: each part will be moved around its own origin |
| | Origin definition | Select between minimum, middle, maximum or user defined. You can also click on “Indicate point” and select a point directly on the scene. The gizmo will move to visualize your choice. |
| To default position | Click to move the origin of the translation to the default position (see Translate to Default Position, page 229). | |
| To default Z | Click to move the part to the default Z-height. X and Y will remain unchanged. | |
| Apply | Apply the changes. The dialog box won’t close, so you can easily perform the translation in multiple steps. | |
| OK | Apply the changes. The dialog will be closed automatically. | |



To move interactively, click on an axis of the translation gizmo and drag to move the part along that axis. It is also possible to click on a plane of the gizmo to move the part within that plane.

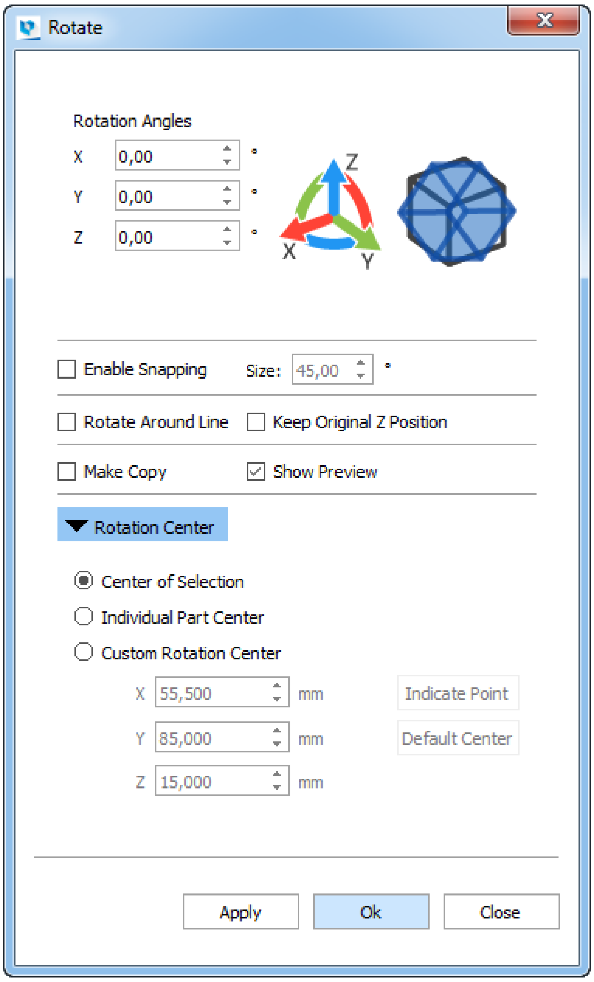
*Remarks*:

- The translate function will always take the selected user coordinate system into account.
- By default, if only one part is selected, the translation gizmo will appear in the minimum point* of the bounding box of the part. If multiple parts are selected, the gizmo will appear in the minimum point of the bounding box of all selected parts. All the parts will then be translated together, without changing the distances between the parts.

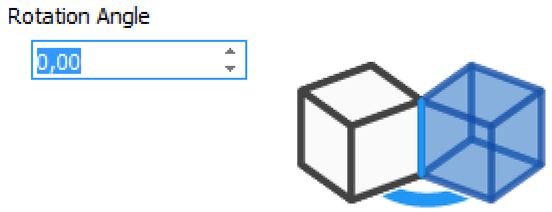
*The position of where the gizmo appears depends on what you select in “Define origin for selected parts”

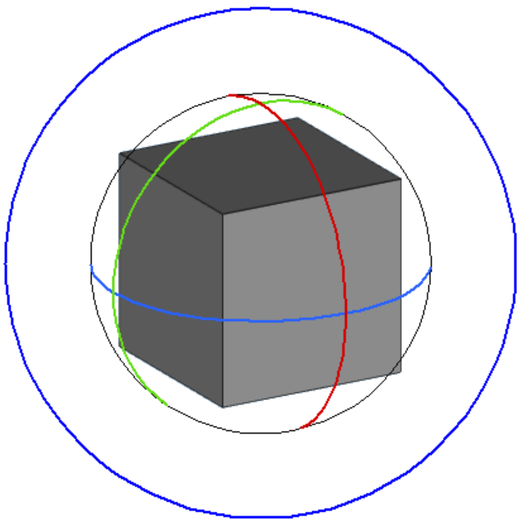
## 6.1.2 Rotate


Rotate the selected part(s) interactively or by inputting values.




| | |
|---|---|
| Rotation Angles | Fill in the desired rotation angles in the X, Y and Z fields. The positive rotation sense is counter clockwise (CCK). |
| Enable snapping | Enable if you want to rotate with specified intervals. (For example: rotate per 45°) You can use the snapping option both for interactive rotation and with angle fields. |
| Size | The snapping value used. |
| Rotate around line | After enabling, select a line (part/triangle edge) around which you want to rotate. You can then rotate interactively or by inputting a value. |

| | |
|---|---|
| | <br>*Remark: With this function it is fairly easy to create living hinges* |
| Keep original Z position | When enabled, the part's minimal Z-position will stay the same while rotating. |
| Make copy | Magics will create a copy on the desired place and keep the original part on his place. |
| Show preview | When enabled, a preview will appear to show the result of the inputted values. |
| Rotation Center | There are 3 options available:<br>— Center of selection: If multiple parts are selected, they will all rotate around the center of the selection, moving their position.<br>— Individual part center: Each part will rotate around its own center, so their position won't change, only the orientation.<br>— Custom rotation center: You can define a point around which the selected part(s) should rotate. With "Indicate point", you can easily select a rotation center. "Default center" resets the values to the center of the selection. |
| Apply | Apply the changes. The dialog box won't close, so you can easily perform the rotation in multiple steps. |
| OK | Apply the changes. The dialog will be closed automatically. |



To rotate interactively, click on an axis of the rotation gizmo and drag to rotate the part along that axis. To rotate perpendicularly to the screen, use the outer (blue) circle. To rotate in an unrestricted way, click in between the axes of the rotation gizmo and drag.

*Remark*: The interactive rotate function will always take the selected user coordination system into account.

### 6.1.3 Pick and Place Parts

This command allows the user to translate and rotate (around the axis perpendicular to the platform) selected parts on a platform by mouse movements. You can select the part by first clicking on the icon and then clicking on the part. The pick and place tags will appear. There are nine tags on a selected part in the pick and place mode:

- One translation tag: the filled green or white circle located in the center of the part.
- Eight rotation tags: the hollow green or white tags located on the corners of the bounding box.

This command allows easy positioning and nesting of the parts on the building platform. With the collision detection-feature (Ribbon Analyze & Report > Collision Detection, see, page 277), the user can check if the parts aren't positioned inside each other.

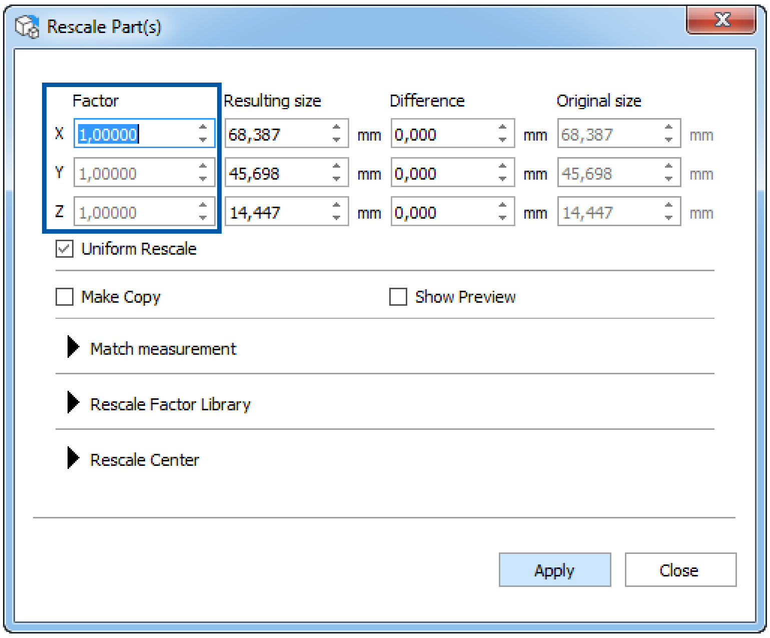
If the cursor is positioned above the translation tag, the cursor will change to the translation cursor (). To translate the part, push the left mouse button. If several parts are selected, they will all move in the same direction over the same distance.

*Remark*: For speeding up the process, the option real-time interaction can be switched off.

### 6.1.4 Rescale

A part can be rescaled with different factors in the three main directions.

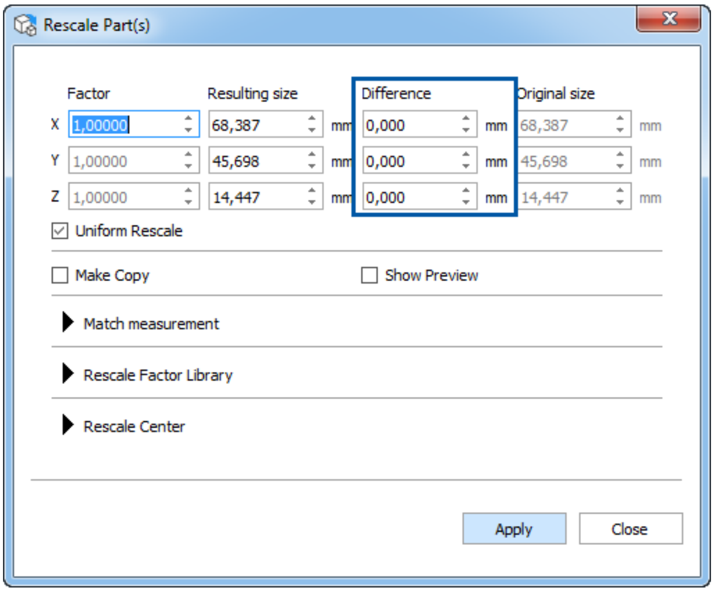
### 6.1.4.1 Rescale factor




The factor is a multiplying value for the dimensions in that direction. When the factor is 1, no rescaling is done, when the factor is 2, the size is doubled. A factor bigger than 1 will enlarge the part, a factor smaller than 1 will shrink the part.

| | |
|---|---|
| Uniform Rescale | The rescale factor is identical in all directions |
| Show Preview | Checking this box will show a preview of the rescale |

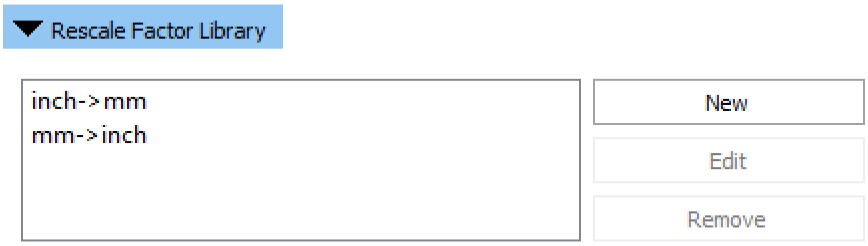
### 6.1.4.2 Difference Dimensions




If you want a part to become for instance 2mm bigger in the X-direction, enter 2 in the dX edit box. The corresponding factor(s) will change accordingly.

| | |
|---|---|
| Uniform Rescale | The rescale factor is identical in all directions |

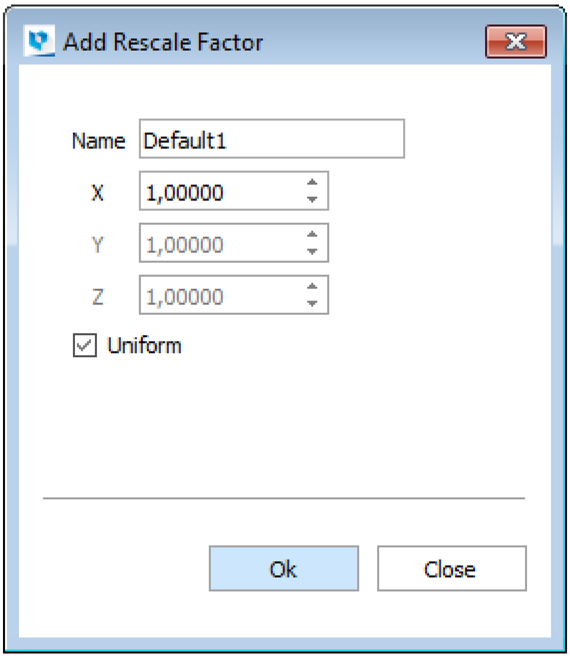
### 6.1.4.3 Rescale Factor Library




This library contains all stored rescale factors. This allows you to rescale your part very fast with the most common rescale factors. You can edit and add new rescale factors very easily.

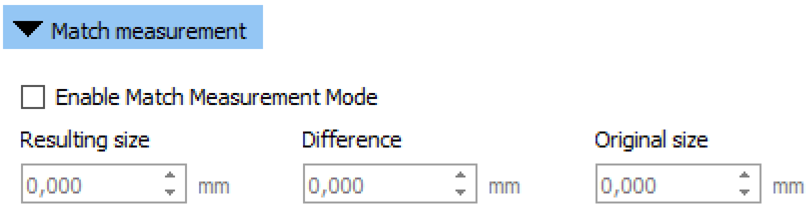
| | |
|---|---|
| New | Create a new rescale factor. (see dialog box below) |
| Edit | Open the selected rescale factor so you can edit it. |
| Delete | Delete the selected rescale factor. |

#### 6.1.4.3.1 Add Rescale Factor




| | |
|---|---|
| Name | The name of the rescale factor |
| Direction | Different directions can be specified to perform the rescale |
| Uniform Rescale | The rescale factor is identical in all directions |

### *6.1.4.4 Match*

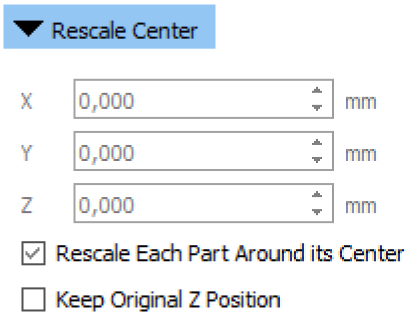



A required value or indicated measurement can be used to rescale the part.

| | |
|---|---|
| Size bounding box | The part can be rescaled in X, Y and Z direction. (Following the bounding box) |
| Measurement (M) | A defined measurement can be used to rescale the part. |
| Select Measurement | By clicking the 'Select Measurement' button a measurement can be selected. |
| Current value | The indicated value is shown. |
| New value | The desired value. |

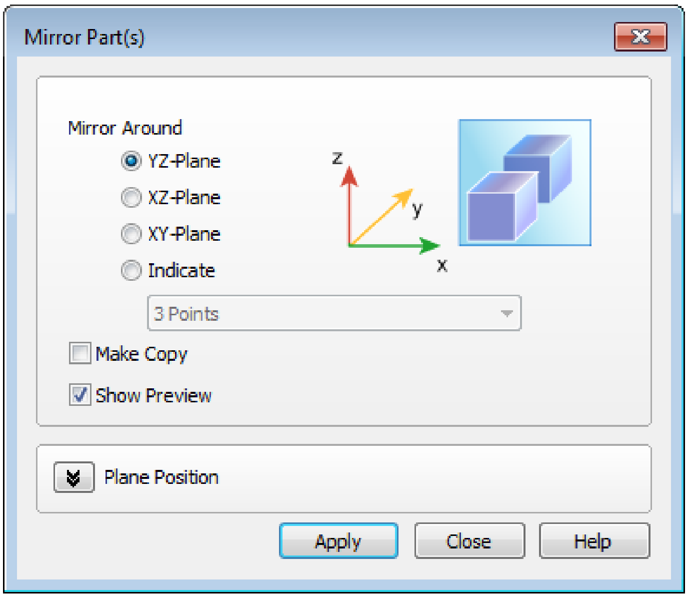
### *6.1.4.5 Advanced options*

#### 6.1.4.5.1 Rescale Center




Rescaling is by default done around the center of each part individually. Rescale Center allows the user to define a rescale center different than the center of the WCS and enter the desired coordinates. Each part will now be rescaled around this new center. The original z-position can be maintained. You can also choose to add the scale factors to the part name.

### 6.1.5 Mirror





When mirroring parts, you can choose to do this in:

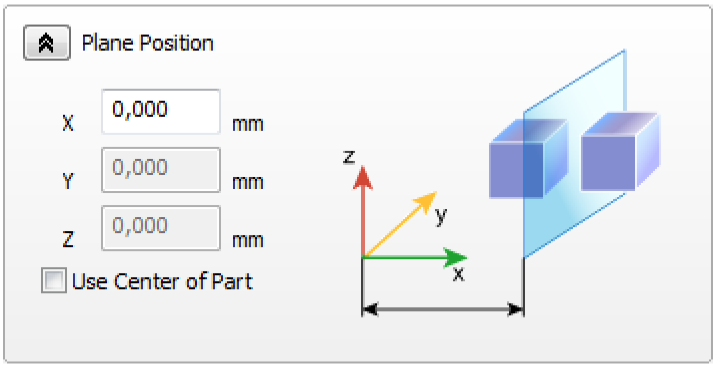
- X-direction (around a plane parallel to the YZ-plane)
- Y-direction (around a plane parallel to the XZ-plane)
- Z-direction (around a plane parallel to the XY-plane)
- By indication from the user
- 3 points

- Perpendicular on indicated line
- Coincident with indicated triangle
- Parallel with screen

If you check the ‘Make Copy' checkbox, the part is copied and thus there will remain a part at the position of the original one. When several parts are selected, they will be mirrored around their common center, in case you accept the default option of mirroring around the center of the Parts.

If the ‘Show Preview’-checkbox is checked, a preview is shown before any changes are made. Changes are only applied when you click on ***Apply***.

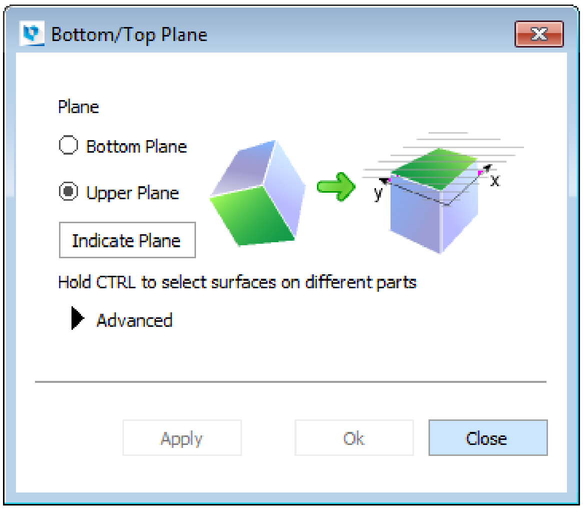
#### *6.1.5.1 Plane Position*

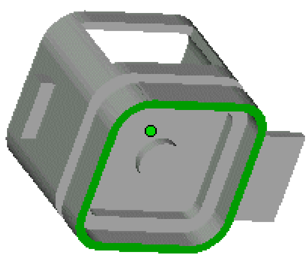
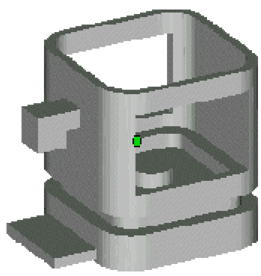



The real position of the mirror plane is defined by a point of the mirror plane. This point is by default the center of the part but you can also enter coordinates. Because the mirror planes are always parallel to two axes of the coordinate system, it is sufficient to give only one of the coordinates. Magics will only ask you for the relevant coordinate.

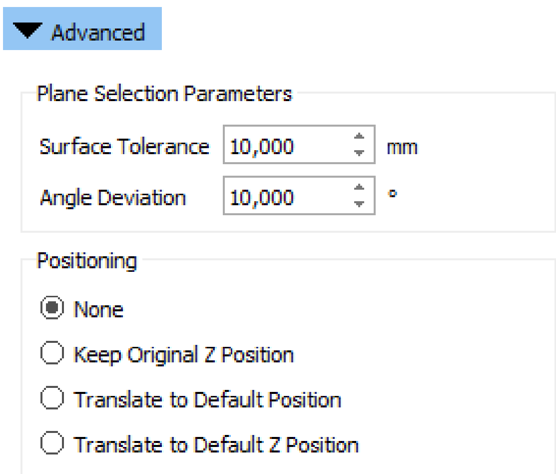
### 6.1.6 Bottom/Top Plane


This command allows easy orientation of the part by indicating a plane as the bottom/top plane. This plane will be automatically oriented parallel to the platform. The bottom/top plane window looks like this:




| | |
|---|---|
| Indicate Plane | The user selects one triangle and a whole plane (according to the plane selection parameters) will be indicated by the default green marking color. The selected plane will be placed parallel to the platform (// XY-plane). E.g. Bottom plane selection in the following figure. |
| |   |

### 6.1.6.1 Advanced

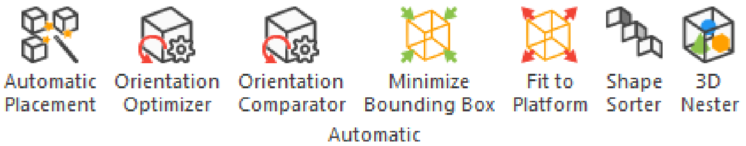


| | |
|---|---|
| Plane Selection Parameters | |
| Surface Tolerance | Indicates the maximum deviation in mm or inches that a related triangle may have to be part of the same plane that contains the selected triangle |
| Angle Deviation | Indicates the maximum angle in degrees between the normals of a related triangle and the selected triangle, in order to be part of the same plane. |
| Positioning | |
| None | No translation is done. |
| Keep Original Z Position | The part first will be rotated and next will be translated in such a way that the original minimum Z position remains the same. |
| Translate to Default Position | The part first will be rotated and next will be translated to the default part position. |
| Translate to Default Z position | The part will be translated to the default Z position. |

*Remark*:

— The indicate place function is only performed when the part is loaded in standard mode. If the part is loaded in compact mode, the indicate plane function is going to act like indicate triangle.
— Use CTRL+click left mouse button so select multiple parts. Click a part a second time to deselect.

## 6.2 Automatic




### 6.2.1 Automatic placement

This command will nest the loaded parts on the building platform. Please note that for nesting the parts in 3D, the Sintermodule (see Sintermodule, page 27) is required. There are two options:

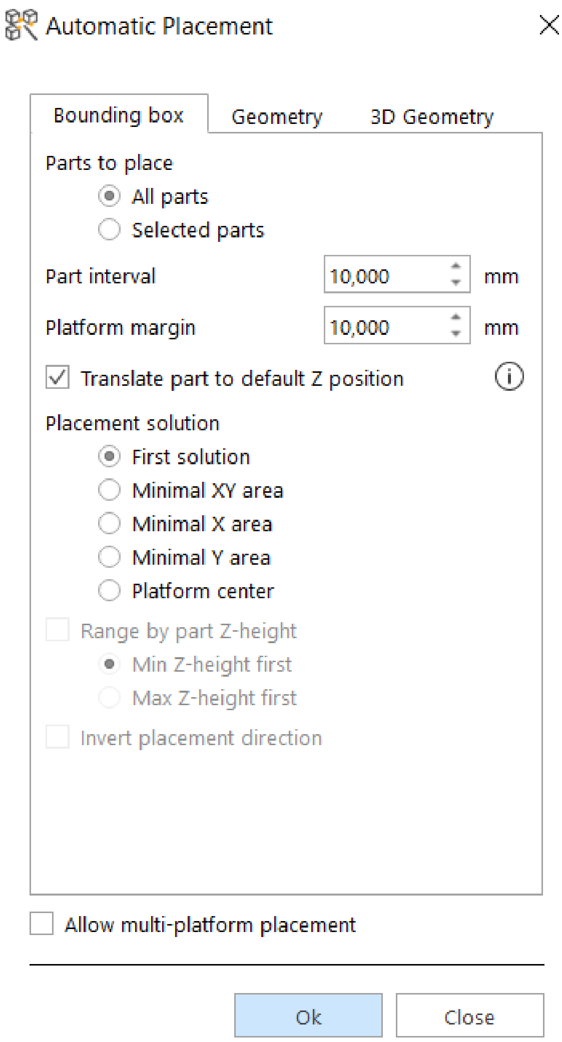
There are two options:

— Geometry based nesting
— Bounding box based nesting

Please recall, that while importing multiple parts you can also use the automatic placement algorithm to immediately position your parts on the platform. Automatic placement is also possible when the platform isn't big enough to load all the specified parts on the platform. A dialog box will appear indicating no solution is found, but a search is performed to find a solution outside platform borders. So even if the parts don't fit the platform, they are spread out to have a better overview.

### *6.2.1.1 Bounding box*

Magics will nest the parts, representing the parts by their bounding boxes. This will result in a fast nesting, however the full surface of your machine will not be used due to the rough representation of the parts.

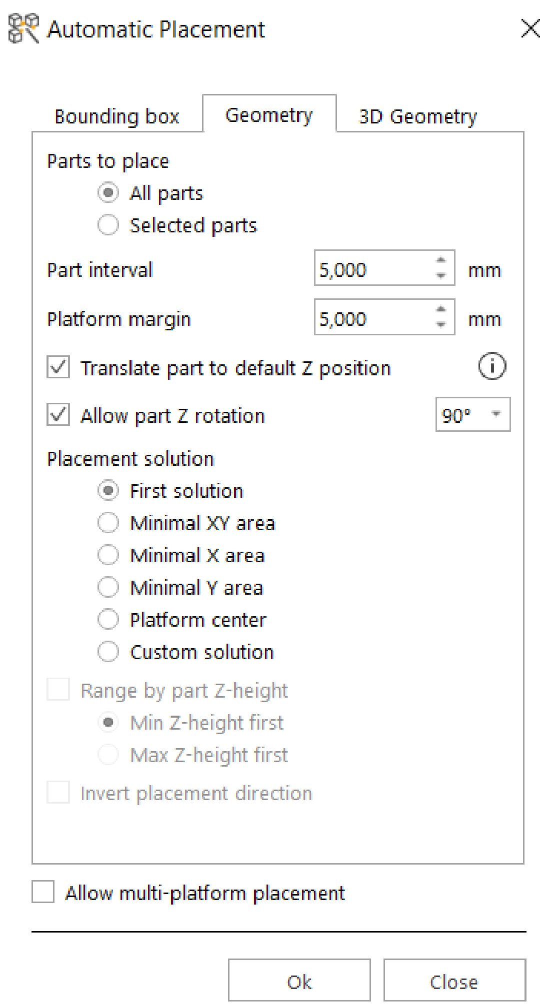



| | | |
|---|---|---|
| Parts to place | All Parts | Nests all the parts or only the selected parts. |
| | Selected Parts | |
| Part Interval | The minimum distance between two parts. | |
| Platform Margin | The minimum distance between (the bounding box of) a part and the edge of the platform | |

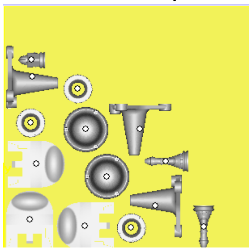
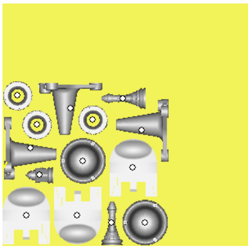
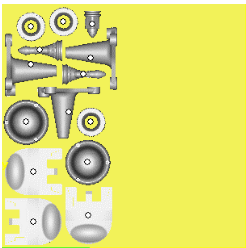
<table>
<tr><td>Translate part to default Z position</td><td colspan="4">Moves the parts to the default z-height, but will remove the support</td></tr>
<tr><td>Allow multi-platform placement</td><td colspan="4">If this option is checked and the nested parts don’t fit on the current Platform, Magics will create as many as needed new Platforms to nest all (or the selected) Parts.</td></tr>
<tr><td colspan="5">Placement solution</td></tr>
<tr><td>First Possible Solution</td><td colspan="4">With this option, Magics offers the first placement he finds for which all parts are nested on the platform.</td></tr>
<tr><td rowspan="2">Minimal XY area</td><td rowspan="2">The total surface area of all the loaded parts is minimized.</td><td rowspan="2">Range by part Z-height</td><td>Max Z-height first</td><td rowspan="2">Arrange parts in the order of their height (either ascending or descending).</td></tr>
<tr><td>Min Z-height first</td></tr>
<tr><td rowspan="3">Minimal X area</td><td rowspan="3">The delta-X of the total surface area of the loaded parts is minimized.<br>Invert direction: The total surface area of the loaded parts is minimized on the opposite side of the platform.</td><td rowspan="2">Range by part Z-height</td><td>Max Z-height first</td><td rowspan="2">Arrange parts in the order of their height (either ascending or descending).</td></tr>
<tr><td>Min Z-height first</td></tr>
<tr><td>Invert placement direction</td><td colspan="2">The total surface area of the loaded parts is minimized on the opposite side of the platform.</td></tr>
<tr><td rowspan="3">Minimal Y area</td><td rowspan="3">The delta-Y of the total surface area of the loaded parts is minimized.<br>Invert direction: The total surface area of the loaded parts is minimized on the opposite side of the platform.</td><td rowspan="2">Range by part Z-height</td><td>Max Z-height first</td><td rowspan="2">Arrange parts in the order of their height (either ascending or descending).</td></tr>
<tr><td>Min Z-height first</td></tr>
<tr><td>Invert placement direction</td><td colspan="2">The total surface area of the loaded parts is minimized on the opposite side of the platform.</td></tr>
<tr><td rowspan="2">Platform center</td><td rowspan="2">Parts are nested around the center of the platform. A circular shape is created.</td><td rowspan="2">Range by part Z-height</td><td>Max Z-height first</td><td rowspan="2">Arrange parts in the order of their height (either ascending or descending).</td></tr>
<tr><td>Min Z-height first</td></tr>
</table>

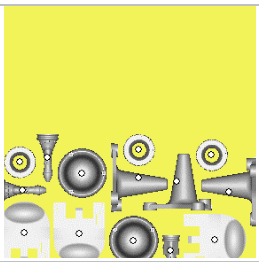
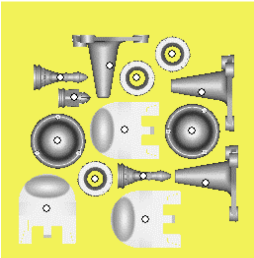
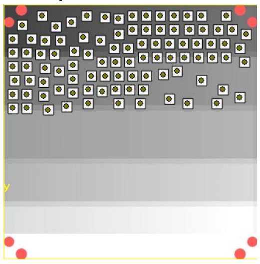
### *6.2.1.2 Geometry*

A nesting based on bounding box can cause a waste of capacity in case of parts, which are having a big bounding box but a small projected area. Magics will nest the parts using the actual form of the parts and so increase the efficiency of the nesting.



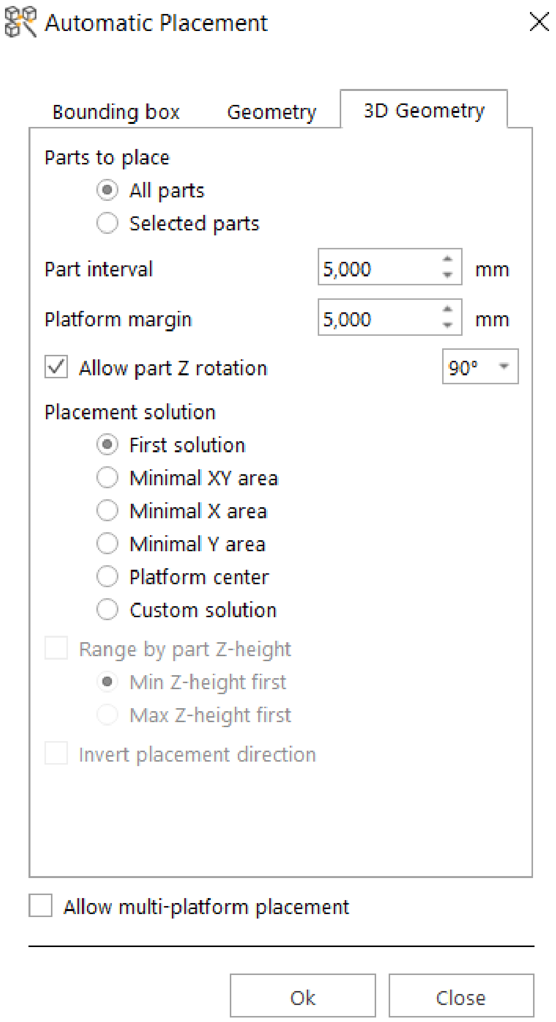

| | | |
|---|---|---|
| Parts to place | All Parts | Nests all the parts or only the selected parts. |
| | Selected Parts | |
| Part Interval | The minimum distance between two parts. | |
| Platform Margin | The minimum distance between (the bounding box of) a part and the edge of the platform | |
| Translate part to default Z position | Moves the parts to the default z-height, but will remove the support | |

<table>
<tr><td>Allow part Z rotation</td><td colspan="4">Allow part Z rotation will give Magics the liberty to rotate the parts while Autoplacing. The angle with which the parts can be rotated can be specified in the dropdown menu. Smaller angles will take longer to calculate, but might result in a denser nesting.</td></tr>
<tr><td>Allow multi-platform placement</td><td colspan="4">If this option is checked and the nested parts don’t fit on the current Platform, Magics will create as many as needed new Platforms to nest all (or the selected) Parts.</td></tr>
<tr><td colspan="5">Placement solution</td></tr>
<tr><td>First Possible Solution</td><td colspan="4">With this option, Magics offers the first placement he finds for which all parts are nested on the platform.<br></td></tr>
<tr><td rowspan="2">Minimal XY area</td><td rowspan="2">The total surface area of all the loaded parts is minimized.<br></td><td rowspan="2">Range by part Z-height</td><td>Max Z-height first</td><td rowspan="2">Arrange parts in the order of their height (either ascending or descending).</td></tr>
<tr><td>Min Z-height first</td></tr>
<tr><td rowspan="3">Minimal X area</td><td rowspan="3">The delta-X of the total surface area of the loaded parts is minimized.<br></td><td rowspan="2">Range by part Z-height</td><td>Max Z-height first</td><td rowspan="2">Arrange parts in the order of their height (either ascending or descending).</td></tr>
<tr><td>Min Z-height first</td></tr>
<tr><td>Invert placement direction</td><td colspan="2">The total surface area of the loaded parts is minimized on the opposite side of the platform.</td></tr>
<tr><td rowspan="2">Minimal Y area</td><td rowspan="2">The delta-Y of the total surface area of the loaded parts is minimized.</td><td rowspan="2">Range by part Z-height</td><td>Max Z-height first</td><td rowspan="2">Arrange parts in the order of their height (either ascending or descending).</td></tr>
<tr><td>Min Z-height first</td></tr>
</table>

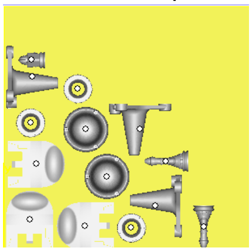
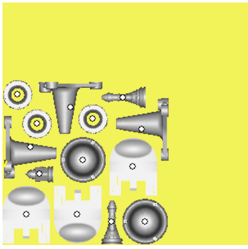
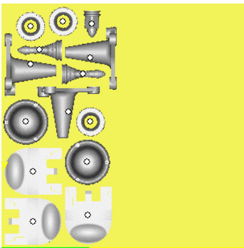
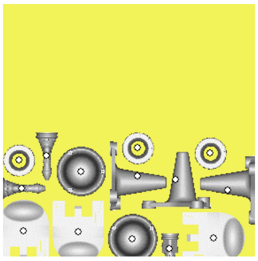
| | | | | |
|---|---|---|---|---|
| |  | Invert placement direction | The total surface area of the loaded parts is minimized on the opposite side of the platform. | |
| Platform center | Parts are nested around the center of the platform. A circular shape is created.  | Range by part Z-height | Max Z-height first<br>Min Z-height first | Arrange parts in the order of their height (either ascending or descending). |
| Custom solution | With this option, you can add a grayscale image to assign priority or penalty zones for Autoplacement.  | Range by part Z-height | Max Z-height first<br>Min Z-height first | Arrange parts in the order of their height (either ascending or descending). |
| Allow multi-platform placement | If the parts don't fit on one platform, new platform(s) are automatically opened and the remaining part(s) are placed on them. | | | |

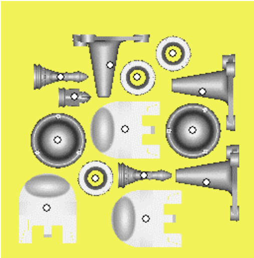
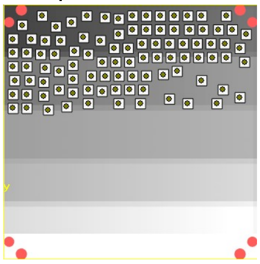
### *6.2.1.3 3D Geometry (for e-Stage users only)*

Magics will nest the parts while making sure that the projection on the platform of the parts does not intersect.



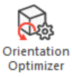

<table>
<tr><td rowspan="2">Parts to place</td><td>All Parts</td><td rowspan="2">Nests all the parts or only the selected parts.</td></tr>
<tr><td>Selected Parts</td></tr>
<tr><td>Part Interval</td><td colspan="2">The minimum distance between two parts.</td></tr>
<tr><td>Platform Margin</td><td colspan="2">The minimum distance between (the bounding box of) a part and the edge of the platform</td></tr>
<tr><td>Allow part Z rotation</td><td colspan="2">Allow part Z rotation will give Magics the liberty to rotate the parts while Autoplacing. The angle with which the parts can be rotated can be specified in the dropdown menu. Smaller angles will take longer to calculate, but might result in a denser nesting.</td></tr>
<tr><td>Allow multi-platform placement</td><td colspan="2">If this option is checked and the nested parts don’t fit on the current Platform, Magics will create as many as needed new Platforms to nest all (or the selected) Parts.</td></tr>
<tr><td colspan="3">Placement solution</td></tr>
</table>

| | | | | |
|---|---|---|---|---|
| First Possible Solution | With this option, Magics offers the first placement he finds for which all parts are nested on the platform.  | | | |
| Minimal XY area | The total surface area of all the loaded parts is minimized.  | Range by part Z-height | Max Z-height first | Arrange parts in the order of their height (either ascending or descending). |
| | | | Min Z-height first | |
| Minimal X area | The delta-X of the total surface area of the loaded parts is minimized.  | Range by part Z-height | Max Z-height first | Arrange parts in the order of their height (either ascending or descending). |
| | | | Min Z-height first | |
| | | Invert placement direction | The total surface area of the loaded parts is minimized on the opposite side of the platform. | |
| Minimal Y area | The delta-Y of the total surface area of the loaded parts is minimized.  | Range by part Z-height | Max Z-height first | Arrange parts in the order of their height (either ascending or descending). |
| | | | Min Z-height first | |
| | | Invert placement direction | The total surface area of the loaded parts is minimized on the opposite side of the platform. | |
| Platform center | Parts are nested around the center of the | Range by part Z-height | Max Z-height first | Arrange parts in the order of their |

| | | | | |
|---|---|---|---|---|
| | platform. A circular shape is created.  | | Min Z-height first | height (either ascending or descending). |
| Custom solution | With this option, you can add a grayscale image to assign priority or penalty zones for Autoplacement.  | Range by part Z-height | Max Z-height first<br>Min Z-height first | Arrange parts in the order of their height (either ascending or descending). |

## 6.2.2 Orientation optimizer

### *6.2.2.1 Introduction*



The orientation tool was designed to help in analyzing and providing the best orientation for your part. It gives you the possibility to perform an analysis on your part(s) orientation or to automatically calculate the optimal part orientation based on specific criteria. The following criteria are implemented:

- Z-height (build height)
- Support surface
- Maximal cross section
- XY projection
- Support on marked

Depending on the technique that is used different parameters can play a role in the orientation of your parts:

For all techniques the **z-height or build height** is a very important factor. By reducing the build height, the build time can be reduced. The limited build height can also lead to the saving of expensive material.

In Stereolithography, two of the implemented criteria are of particular interest: to minimize the amount of **support surface** and to minimize the **XY projection area**. By orientating the part in such a way that the amount of support surface is minimized, less material and less finishing time is needed for the particular part. Currently, no attention is given to A or B-faces etc. so user interaction will be needed if this has to be taken into account. By minimizing the XY projection area, the parts are oriented in such a way that the total amount of parts on a Stereolithography platform can be maximized. Off course this contradicts with the minimum z-height criterion.

For Laser Sintering (plastics but more importantly in metal sintering) **large cross sections** should be avoided since an object can deform due to thermal stresses generated during the building process. Large cross sections typically generate a lot of thermal stress and should therefore by avoided.

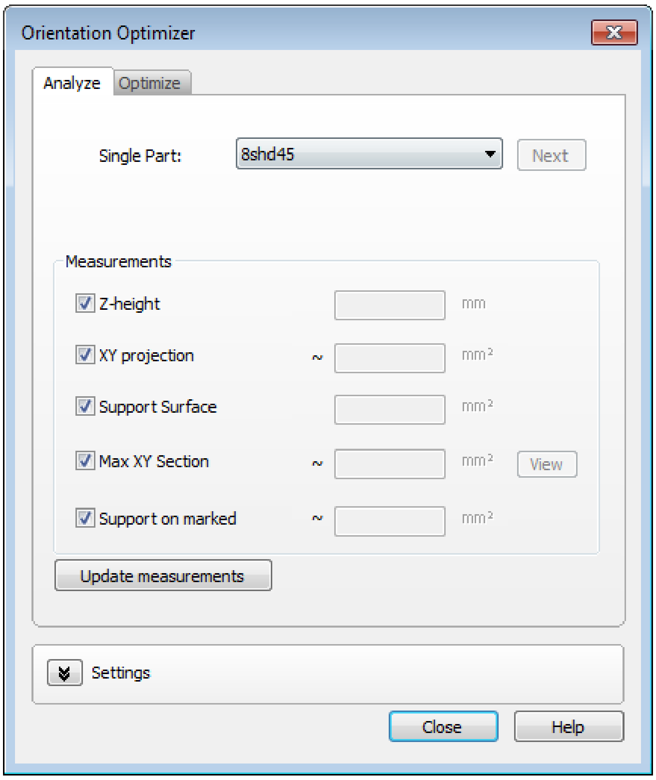
For several techniques, support is needed in order to be able to build the part. There might be surfaces where the support structure is not wanted. For example, on surfaces where it is hard to remove the support in postprocessing.

The criteria **Support on marked** represents percentagewise how much area of the marked area that will need support. A Support on marked value of 10%, for example, implies that 10% of the marked area will need support. The lower the value, the better.

*Remark*: The parameters that are available within the orientation optimizer are depending on the type of license that is active. Z-height and XY projection are available for all users. Support surface and Maximal cross section are linked to other modules (SG and/or e-stage for support surface and SG+ for the maximal cross section)

#### *6.2.2.2 Orientation optimizer: Analyze*

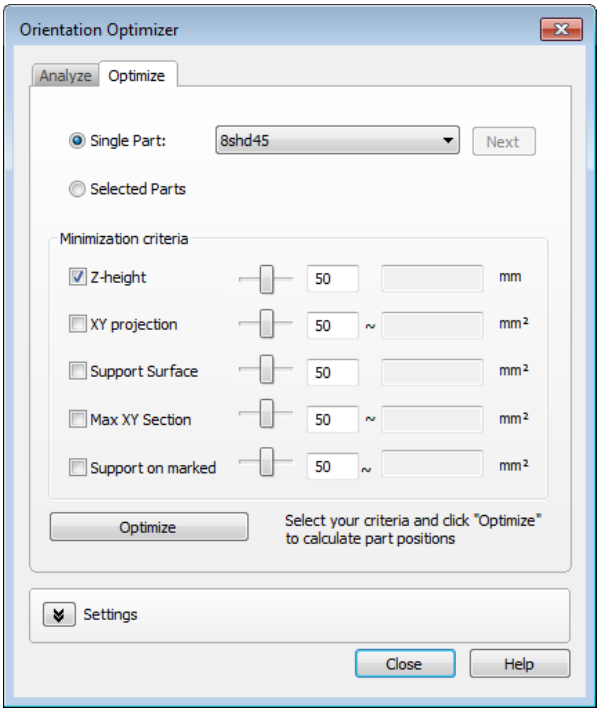
The first page of the orientation optimizer consists of the analysis tool. By pressing the update measurements button, the flagged criteria are calculated on the current orientation of the part. A user can observe the z-height, support surface, etc. in the current orientation of the part.




| | | |
|---|---|---|
| Current part | The analysis is performed part per part. With the “next” button you can navigate to the following part. | |
| Measurements | The measurements are the criteria that are used to analyze the current part(s) orientation. | |
| | Z-height | This gives you the possibility to check per part what the current z-height is (distance from platform to highest point of the part) |
| | Support surface | This gives you the total amount of surface area (in m²) that needs support in the current orientation of the part. |
| | Maximal cross section | The maximum cross sectional area is shown. This is found by slicing the part and calculating the cross section surface area in each slice. |
| | View | Magics shows the maximal cross section on the part |
| | XY projection | This is the projection of the part in the XY plane (on the platform) |
| | Support on marked | This represents how much area of the marked area that will need support (%) |
| Update measurements | The analysis is performed/ executed again. | |

### 6.2.2.3 *Orientation optimizer: Optimize*

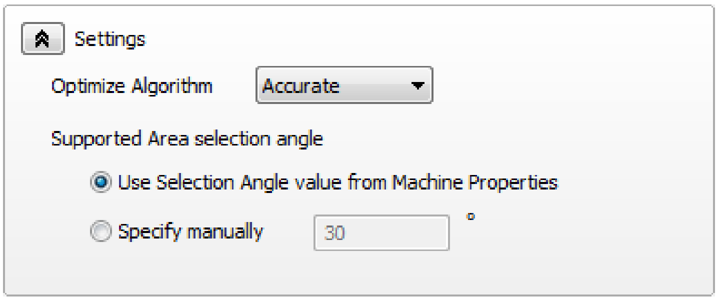
The second page of the orientation optimizer is the real optimization. The current part or multiple parts (the parts selected in the part list) can be automatically oriented by using the criteria given below. The criteria which the user wants to use should be selected and with the sliders a relative weighting of the parameters can be made (e.g. for metal machines one might consider using the parameters Max cross section and support surface together). By pressing “first optimization” the full solution space is calculated by the software and the optimal orientation is applied to the part(s). Afterwards, the sliders can be used to change the relative weighting of the parameters and the orientation of the parts will change on the fly. The more parameters are flagged and the more detail that is required (in the settings tab) the longer the calculation will take.




| | | |
|---|---|---|
| Current part | The optimization is performed on the current part | |
| Selected part | The optimization is performed on the selected parts in the parts list | |
| Minimization criteria | | |
| | Z-height | Orientate the part in such a way, that the height is minimal |
| | Support surface | Orientate the part with the lowest amount of support area |
| | Maximal cross section | Orientate the part to have the smallest maximal cross section. |
| | XY projection | Orientate the part with the lowest amount of XY-projection area. |

| | | |
|---|---|---|
| | Support on marked | Orientate the part to have the smallest support area on the marked surface. |
| First optimization | This button will calculate the values of the selected parameters in the current part orientation. | |

#### 6.2.2.3.1 Settings



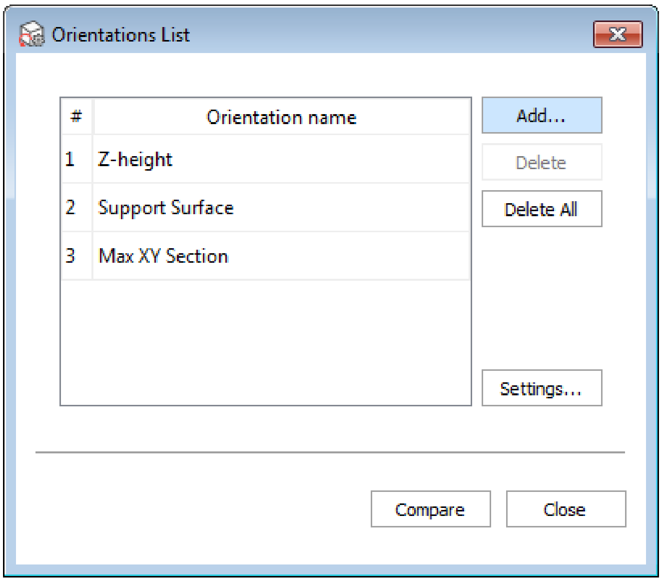

The optimization algorithm calculates all possible 3D orientations for the selected criteria for each part leading to a very large amount of possible solutions. To avoid lengthy calculations, the fast algorithm limits itself to 320 possible orientations whereas the accurate algorithm has a solution space of 1280 orientations

| | | |
|---|---|---|
| Optimize algorithm | Fast | 320 possible orientations are calculated |
| | Accurate | 1280 possible orientations are calculated |
| Supported area selection angle | | |
| | Use selection angle value from machine properties | The parameter that was set in the machine properties is used in the orientation tool.<br><br>See |
| | Specify manually | Specify the support area selection angle manually. |

### 6.2.3 Orientation Comparator

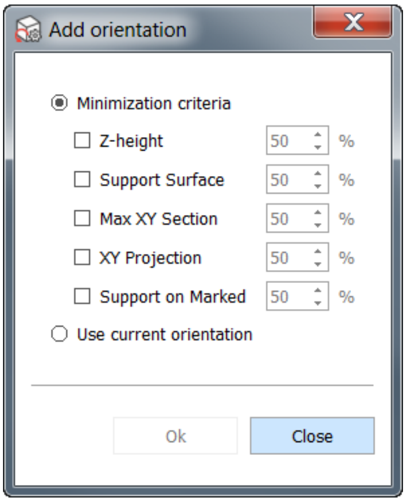

This tool allows you to compare different orientation options and make a good judgement on different parameters. You can analyze the consequences linked to an orientation which can sometimes be hard to notice.

### 6.2.3.1 Orientations List



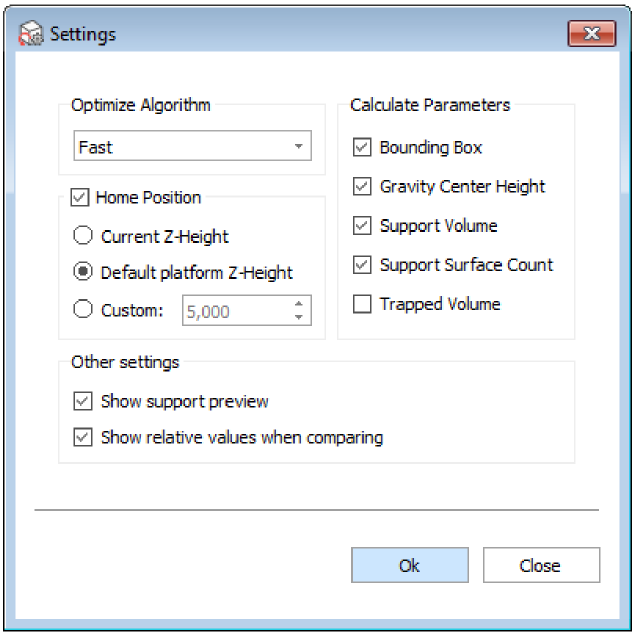

In this dialog, the orientations that will be compared, are listed. By default, the orientations with minimum z-height, support surface and max XY section are included. By clicking 'Add…', you can add an orientation to the list. It is also possible to rename orientations, delete them from the list or change the setting of the comparator. The 'Compare' button will start the calculation and show you the comparison.

#### 6.2.3.1.1 Add…




Adding orientations can be done in two ways. Either you can use the minimization criteria from the orientation optimizer or it is possible to use the current orientation of the part.

#### 6.2.3.1.2 Settings…




In this dialog, the comparator can be configured.

| | | |
|---|---|---|
| Optimize Algorithm | To avoid lengthy calculations, the algorithms is limited to an amount of orientations. | |
| | Fast | 320 possible orientations are calculated |
| | Accurate | 1280 possible orientations are calculated |
| Calculate Parameters | When the checkbox in front of a parameter is checked, this parameter will be calculated when pressing 'Compare'. | |
| | Bounding Box | The volume of the bounding box is calculated. |
| | Gravity Center Height | The z- coordinate of the gravity center is calculated. |
| | Support Volume | An estimation of the support volume is calculated. This estimation is based on the support preview in the supported area preview. |
| | Support Surface Count | The amount of support surfaces when entering SG is calculated. |
| | Trapped Volume | The sum of all trapped volumes is calculated. |

| | | |
|---|---|---|
| Home Position | You can choose whether you want the lowest point of the part to be placed on a specific z-height during the calculation. | |
| | Current Z-Height | The current z-coordinate of the lowest point will be used. |
| | Default platform Z-Height | The default platform z-height that is defined in the machine properties will be used. |
| | Custom | You can define a custom value. |
| Other settings | | |
| | Show support preview | When checked, this will show the support preview in the orientation preview. |
| | Show relative values when comparing | When checked and the comparing toggle is on, the parameters will be shown as relative values with respect to the reference orientation. |

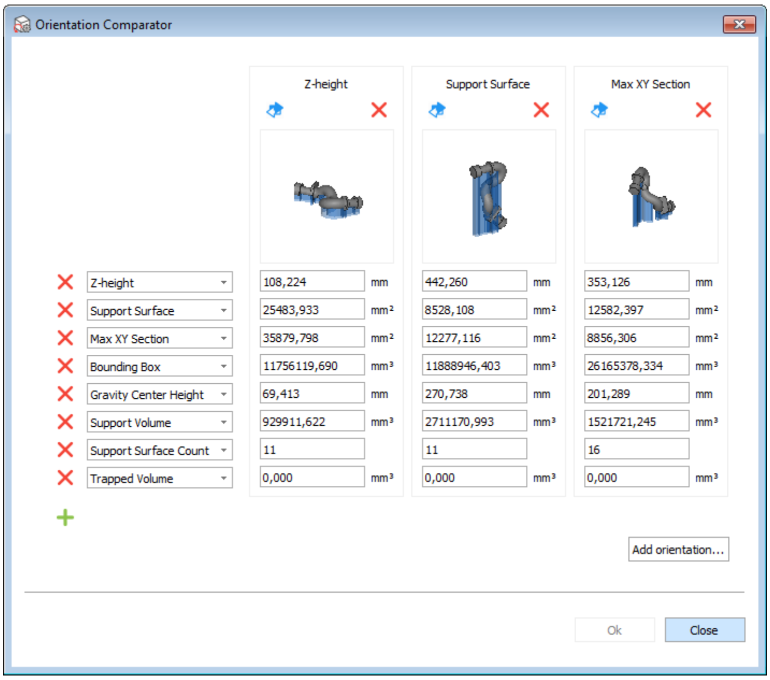
#### *6.2.3.2 Orientation Comparator dialog*

After clicking ‘Compare’ and some calculation time, the Orientation Comparator dialog opens. A preview of the calculated orientations is shown. When you click on the preview, the orientation of the part will change in the scene. This allows more in-depth inspection.

Below the preview, you can find the parameters that correspond with the orientation. It is possible to compare these values with color codes by pressing the Compare toggle . All orientations will be compared with the reference orientation. A green color indication for a certain parameter means that the corresponding orientation is scoring better than the reference orientation on this parameter. The red color stands for a worse score compared to the reference.

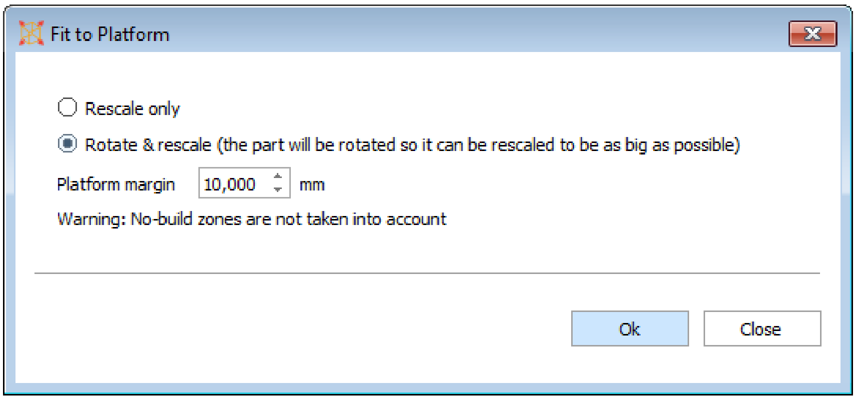
In this dialog, it is also possible to add more orientations by pressing ‘Add orientation…’.

When you found an orientation that you like, select the preview and press Ok. When pressed cancel, the part will go back in the orientation before entering the orientation comparator.




## 6.2.4 Fit to platform

Fit to Platform Fit to platform scales the selected part(s) so it fits in the build envelope of the active machine.



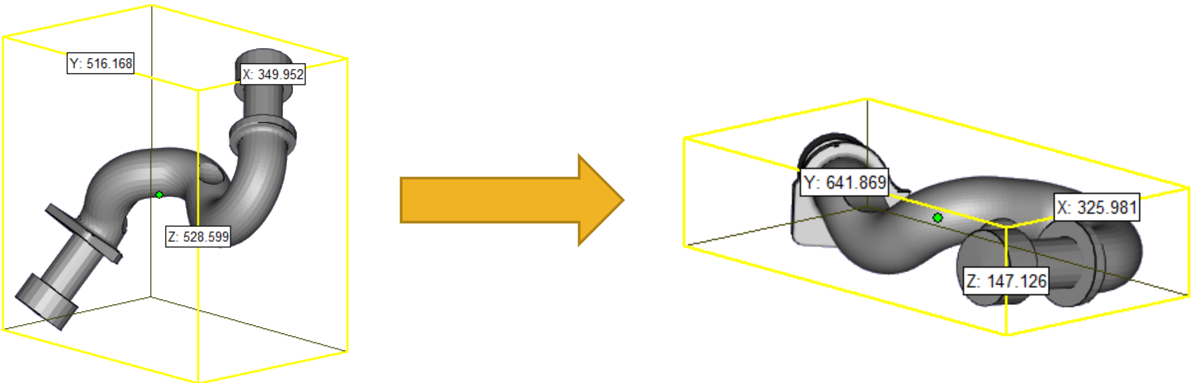

| | |
|---|---|
| Rescale only | When this option is selected, the part will be rescaled without changing the orientation. |
| Rotate & rescale | The part will be rotated so it can be rescaled to be as big as possible. The algorithm takes the shape of the build envelope into account. |

| | |
|---|---|
| Platform margin | The distance between the platform edge and the part. The default value is taken from the Machine properties (Platform -> Automatic placement -> Platform margin). |

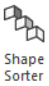
*Remark*: If multiple parts are selected, they will all be rescaled individually. If you want them to be rescaled as one, you will first have to merge them. The default part height (Machine properties -> Platform -> Default part position -> Minimum Z) will also be taken into account to ensure the part will fit into the build envelope.

### 6.2.5 Minimize bounding box

The part will be rotated in such a way that its bounding box is minimized. The scale of the part itself will not change. This function can help with quoting and efficient build preparation.



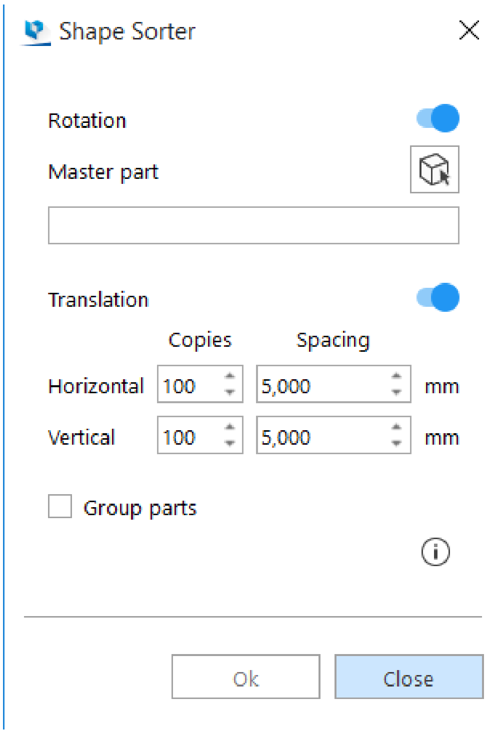

### 6.2.6 Shape sorter



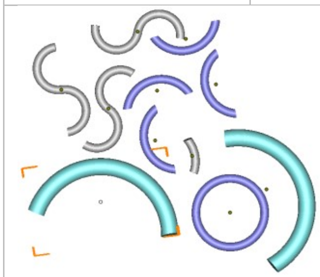
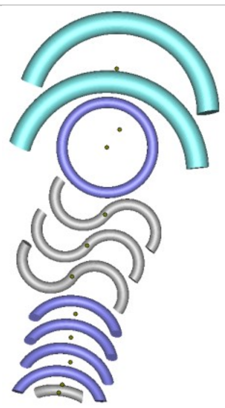
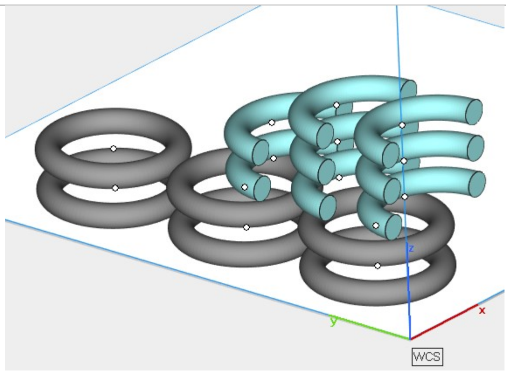
The shape sorter is designed to arrange parts with a similar geometry. The parts can be:

- Rotated only according to the orientation of the Master part
- Translated only, while keeping the orientation of the part
- Both Rotated according to the orientation of the master part and then translated

*Remark*: To utilize the shape sorter functionality you either must have a “Sintermodule” license or a “Support generation” license.




| | |
|---|---|
| Indicate | Click the icon to indicate the master part you want to use. The ‘master part’ mouse mode will become active. |
| Horizontal placement | Indicate the number of copies and the spacing between them that will be placed on the horizontal axes |
| Vertical placement | Indicate the number of copies and the spacing between them that will be placed vertically |
| Copies | Specify the total amount of parts to be placed in a single row or column. Exiting this amount will start a new row based on the master part. |
| Spacing | The minimum distance between two parts. |
| Group parts | All selected parts will be grouped together as one. |

| | | |
|---|---|---|
|  |  |  |
| Indication of master part | Result: Sorting based on position of master part on horizontal only | Result: Sorting based on position of master part on horizontal and vertical |

Advised way of working

- Import multiple similar parts
- Place the part you want to use as master in the correct orientation
- Select all similar parts
- Assign the master part
- Parts are arranged according to the orientation of the master part

### 6.2.7 3D nester

More information can be found in the 3D Nester module itself.

- See 3D Nester, page 479

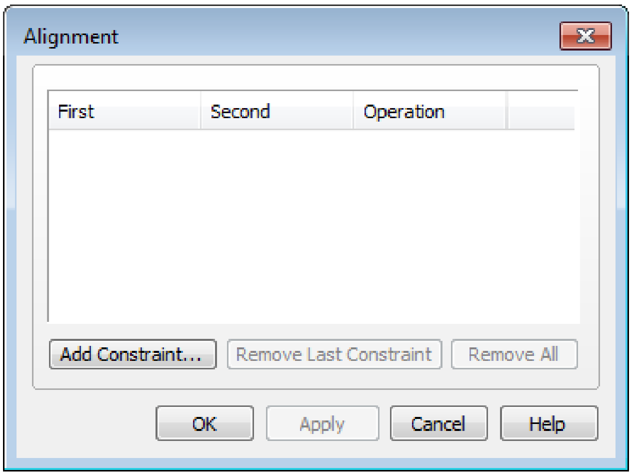
## 6.3 Advanced


### 6.3.1 Alignment

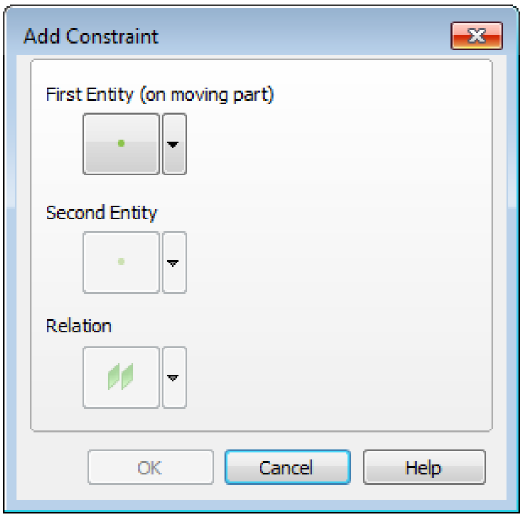
The alignment feature allows you to align one part to another. To align two parts you use ne entity (point, line, circle…) on each part and you define the desired relation between the entities. The relation is called an operation.

*Background Information:*

A part has, in a 3D-space, 6 degrees of freedom (=dof): 3 translation ($t_1$, $t_2$, $t_3$) and 3 rotation ($r_1$, $r_2$, $r_3$) degrees of freedom. The directions 1, 2, 3, 1', 2' and 3' are two sets of 3 directions, perpendicular to each other. Each alignment action of two parts will decrease the amount of dof's with at least 1. At the end no degrees of freedom are left, then the parts are aligned.




| | |
|---|---|
| Add Constraint | A dialog pops up where the user has to define the entities to align and the relation. |
| Remove Last Constraint | Removes the last added constraint. |
| Remove All | Removes all the constraints. |




The Add Constraint dialog box has three buttons:

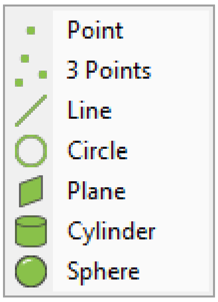
- The first and the second select the entities
- The third is used to select a relation between the entities.
-

At the right of each button, there is an arrow. Pushing these arrows pops up a list with the possibilities for this entity. Pushing the arrow next to the Relation button shows the possible operations for that particular combination of entities. If you agree with the constraint, you can add it to the list by clicking the OK button.

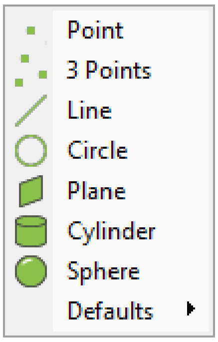
### 6.3.1.1 The Entities

There are six entities you can use to align parts. Each entity has its specific properties. The properties are shortly mentioned in the following table together with a brief explanation. There are eight (so called 'Defaults') you can use to align a part to the coordinate system.

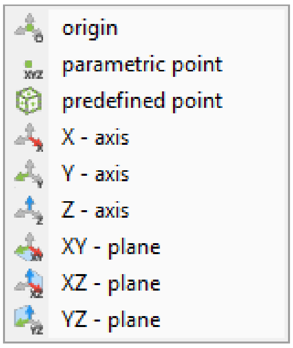
*'First' Entities*




*'Second' Entities and Defaults*




*The Defaults*

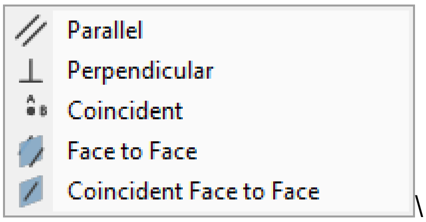



| *Entity* | *Property* | *Description* |
|---|---|---|
| Point | Point Coordinates | Point properties are its coordinates. There is no direction on a point. Thus, when one of the entities is a point, only coincident can be chosen as a relation. |
| Line | Starting- and Endpoint | A line is defined by its starting- and endpoint. It also has a direction. Thus you can make a line parallel or perpendicular to another entity with a direction. |
| Circle | Centre point, Radius and the normal | A center point, a radius and a normal define a circle. The normal is representing the plane containing the circle. It is shown on the screen because the user needs to know the direction of the normal in order to choose between 'Parallel' and 'Face to face'. |
| Plane | The normal of the plane and the point where you marked | A plane is defined by its normal and by the point you marked the plane with. The normal of a plane can be derived from the STL data. It follows the normal of the triangles of the plane (i.e. outside of the object) |
| Cylinder | Direction of the axis, radius and a point on the axis | The properties of a cylinder are the radius, the direction of the axis and a point on the axis. A cylinder is internally treated as a line (the cylinders axis). Thus, a certain operation on a line or on a cylinder will result in the same change of dof's. |
| Sphere | Centre point and radius | The properties of a sphere are the center of the sphere and its radius. A sphere is |

| | | |
|---|---|---|
| | | treated as a point (the center of the sphere). |

*Remark*: Using the align function for the creation of a new UCS will show the defaults and not the first entities like in the image above.

### *6.3.1.2 Relations*




There are five possible relations. You can make two entities Parallel, Perpendicular, Coincident, Face-to-Face or Coincident Face-to-Face.

| | |
|---|---|
| Parallel | This operation will make the two entities parallel, their normal pointing in the same sense. |
| Perpendicular | When for example two planes are perpendicular, there will be an angle of 90° ($\pi$/2 rad) between them. |
| Coincident | Coincident is chosen when you want two entities to be on the same location. |
| Face to Face | The two entities will be parallel, and their normal will point in the opposite sense. |
| Coincident Face to Face | This is a combination of 'coincident' and 'face to face'. |

### *6.3.1.3 Advised Way of Working*

Select 2 parts and push the alignment button (Tools Toolbar by default) or choose for Menu/Tools/Alignment to enter the alignment mode.

- Click on the Add Constraint button.
- Only the Select First Entity button is available. Click it and mark the first entity.
- The Select Second Entity button becomes available. Once you marked the second entity, the Relation button becomes available as well.
- From now on you can change the first entity (type can also be changed) and the second entity (and if desired its type) until you choose a relation.
- If the listed set of instructions aligns the parts as desired, push the OK button.
- Now you can proceed with another constraint.

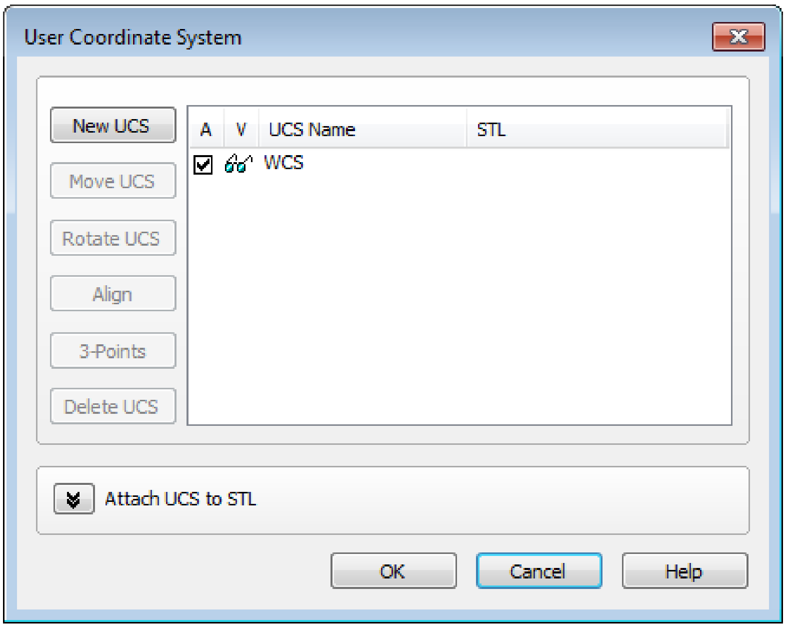
If you want to exit, push the OK button on the dialog box or if you don't want to save the operations, close the dialog box with the Cancel button of the dialog box in the upper right corner of the window.

#### *6.3.1.4 A closer look on the relations and entities*

Strictly there are only two kinds of relations: an orienting and a locating operation. The Parallel, Perpendicular and Face to face are pure orienting operations. The directions of the two entities are opposite in the Face to face orientation. Coincident is a locating operation. When you choose Coincident, an orientation is added if the entities have a direction, as is the case for a plane. Coincident Face to face is again a combination. It's the same as Coincident and Face to face.

### 6.3.2 User Coordinate System

You can define your own coordinate systems (UCS: User Coordinate System). Magics can work with multiple coordinate systems. These coordinate systems are not saved together with a part, because the STL file does not support this. You can save and load the UCS in a project file though (*.magics) that includes the description of the user defined coordinate systems.




| *Column* | *Description* |
|---|---|
| Active (A) | If you have more coordinate systems, you can make one of them active. Internally, the program works as if the active coordinate system is the only one. Creating primitive volumes, measuring, cutting, labelling... everything is done in the active coordinate system. Therefore only one coordinate system can be active. |

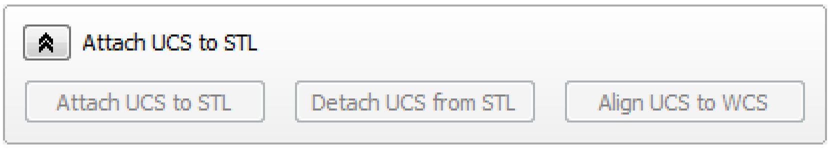
| | |
|---|---|
| | Thus, you can only see one checkbox indicated in the A (Active) column of the list. In the example above, WCS is active.<br>*Remark:* If you load a part, it will be loaded in the active coordinate system. If in a previous Magics session, you saved a part at position (10,10,10) in a particular coordinate system it will be loaded at (10,10,10) in the active coordinate system. If the two coordinate systems are different, the part will have a different absolute position in the World Coordinate System, the reference system of Magics. |
| Visualization (V) | It can be useful to have a few coordinate systems shown on the screen. The second column of the list has glasses for the coordinate systems to show and grayed glasses for coordinate systems to hide.<br>*Remark:* If you check View/Coordinate System to make your Coordinate system visible, you trigger the visibility of all the defined coordinate systems. To make 1 system visible or invisible, go to the UCS dialog. |
| UCS Name | The name of the coordinate systems can be changed. Keep in mind that the World Coordinate System cannot be moved nor deleted. |
| STL | When an UCS is attached to a part, the name of the part is shown in this column. |

| *Button* | *Description* |
|---|---|
| New UCS | A first way to create a new coordinate system is to start from an existing one. Select a coordinate system in the list by clicking in the appropriate row. The background turns blue. Then push the New UCS button. A new coordinate system is then created based upon the chosen one. If you do not select a coordinate system, the new coordinate system will be based upon the WCS. The first time the new coordinate system is on the same position and has the same orientation as the one it is based on. You can then rotate and translate it. |
| Move UCS | The move button leads you to the move dialog where you can enter how much you want the UCS to move in the X, Y and Z direction. |
| Rotate UCS | The rotate button leads you to the rotate dialog where you can enter how many degrees you want the UCS to rotate around the X, Y and Z-axis. |
| Align | The align button will lead you to the align dialog. The align functionality allows you to align axes or planes (XY-plane, etc.) of the UCS to a plane, cylinder, etc. of a part. For further explanation about the align function, see Alignment, page 222. |
| 3-Points | A second way to create an UCS is by defining 3 points. First select an UCS by selecting a row. Then push on the button and go to the working window of Magics. You can select 3 points one after another on a part. The cursor pointer will change into 1, 2, and 3. The first point you |

| | |
|---|---|
| | indicate will be the origin of the selected UCS. The second point determines the direction of the X-axis. The Y-axis is drawn through the origin; parallel with a line that is drawn perpendicular on the X-axis through the third point indicated. The position of the third point towards the X-axis (on which side) determines the sense of the Y-axis. The Z-axis is drawn through the origin, perpendicular on the XY plane. |
| Delete UCS | To delete a UCS, select it, and push the delete button. You select it by clicking in the appropriate row. The background turns blue.<br>*Remark:* The WCS cannot be deleted. If you delete the active UCS, the WCS become active. |

*Remark*: The active User Coordinate System and the World Coordinate System cannot be changed.

#### *6.3.2.1 Attach UCS to STL*

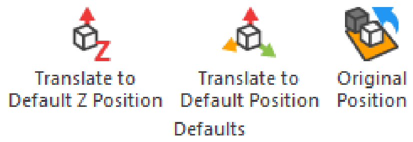



| | |
|---|---|
| Attach UCS to STL | You can attach a UCS to a part. When an UCS is attached to a part it will make the same movement as the part and the relative position of the UCS according to the part will stay fixed. To attach a UCS to a part, select the UCS (mark the row in blue) and select the part. When a UCS is attached to a part, it will be shown in the column STL. |
| Detach UCS to STL | You detach an UCS from a part by selecting the UCS in the list, and pushing the button detaches STL. |
| Align UCS to WCS | When a UCS is attached to a part, you can make it coincide with the WCS. The attached part will make the same rotation and translation as the UCS. To do so, select an attached UCS and click the button. |

### 6.3.3 Import UCS File

You can load a User Coordinate System (.ucs file) created in a CAD program into Magics.

## 6.4 Defaults




### 6.4.1 Translate to Default Z Position

This command will move the selected parts to the default Z position (see Bottom/Top Plane, page 201). If more than one part is selected, the entire group will be moved while their mutual position is kept. This option is also executed when pressing the Home button on your keyboard.

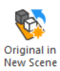
### 6.4.2 Translate to Default Position

This command will move the selected parts to the default position (see Bottom/Top Plane, page 201). If more than one part is selected, each part will be individually moved to the default position. The translation origin is fixed on the minimum X, Y, Z points of the part bounding box.

### 6.4.3 Original Position

Move all selected parts in the current scene to their original position.

### 6.4.4 Original in New Scene

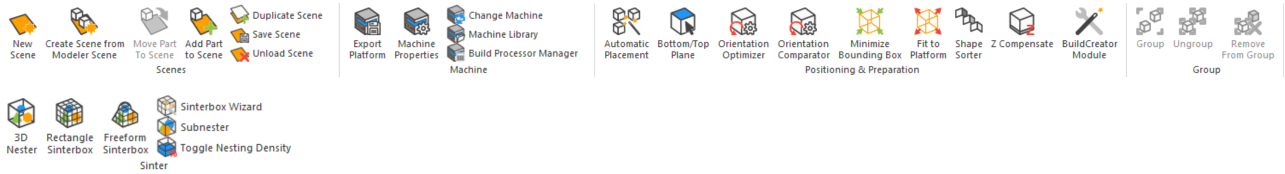


Move all selected parts in the current scene to their original position AND open them in a newly chosen scene. Current scene will not be affected.

### 6.4.5 Save Current Position

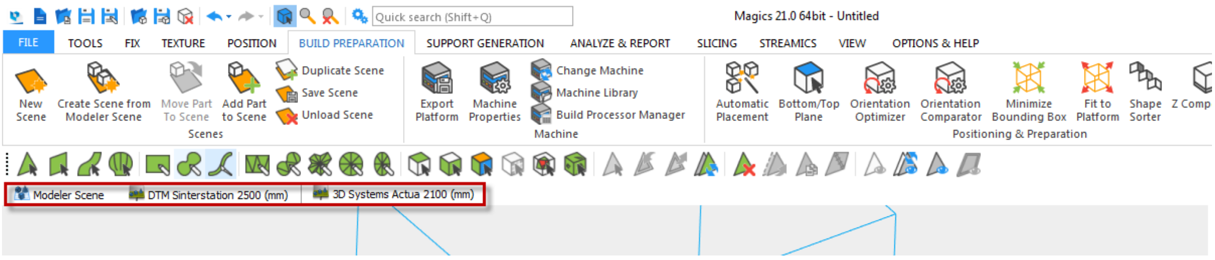
Save the current position as original position. The previous original position will be overwritten.

# 7 Chapter 7: Build Preparation




## 7.1 Scenes

With Scenes, platforms can be created to prepare your build. It gives you a workspace where you can orientate and position your parts in the same way as they should be built by the machine. A lot of parameters can be stored in such a scene. This enables you to create your own, customized platforms. Saving these machine profiles (.mmcf files) will ensure you can work in a fast and standardized way. You can also work on different platforms in parallel. The active scene is the one showed on the screen. You can switch between different scenes by clicking on the name of the platform in the main window (see picture below).




In Scenes, platforms are handled. Platforms can be created, copied, unloaded and exported. If a new scene is generated, you can see that a second tab “modeler scene” is opened. The modeler scene can be recognized by its less blue background and a lack of platform. Every part that is imported into Magics, will be visible in the modeler scene.

To orientate a part on the platform Indicate top or bottom view can be used. There is also a collision detection tool (see Collision detection, page 276) to see if the parts are well positioned on the platform. The automatic placement tool (see Automatic placement, page 203) makes it possible to easily and economically position different parts on the platform. You can calculate the build time and the cost of building some parts.

## 7.2 Scenes: Virtual Copies

This section will explain what virtual copies are and how you have to handle them.

The goal of using virtual copies is to save memory. If you need e.g. 100 copies of a part, there will be a big difference in memory usage if you have to load (and save) 100 parts or only 1 part.

### 7.2.1 A Part and his Virtual Copies

The real parts are collected in the modeler scene. The modeler scene acts as the database of loaded parts. From this database you can create virtual copies on platforms. This virtual copy contains a reference to the real part and a translation matrix.

To make it possible and user friendly to work with virtual copies, the structure of parts and copies is as shown in the picture below.

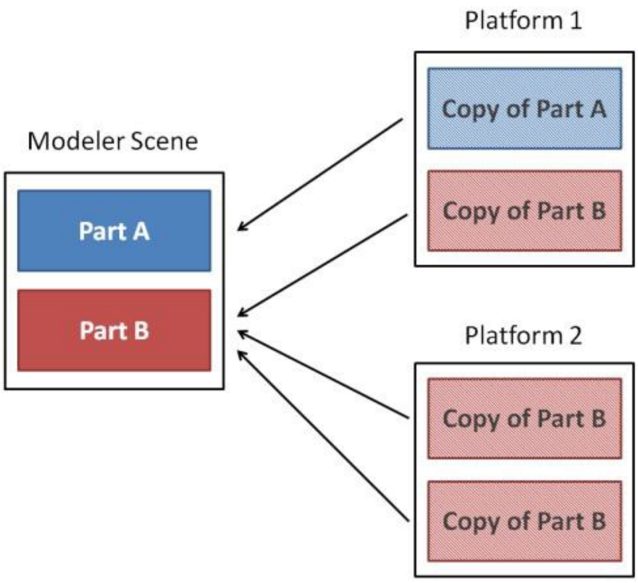
***Example***

The picture below shows an example of the principle of real parts and their virtual copies. This example will be used in the next sections to illustrate the behavior of parts and virtual copies.

In this example:

- The modeler scene contains 2 real parts, i.e. part A and part B.
- Platform 1 contains 1 virtual copy of part A and 1 of part B.
- Platform 2 contains 2 virtual copies of part B.
-

The arrows on the picture below, indicate that *"Copy of Part B"* is based on the real "*Part B*" from the modeler scene.



### 7.2.2 Edit a Virtual Copy

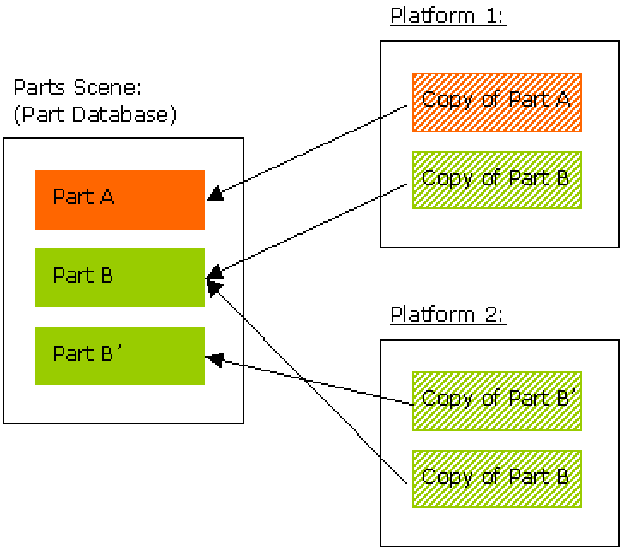
If you edit a real part (in the modeler scene), all virtual copies of that part, present in the current Magics session, will be edited in the same way.

***Example***

Suppose you select and edit one of the virtual copies of part B on platform 2.

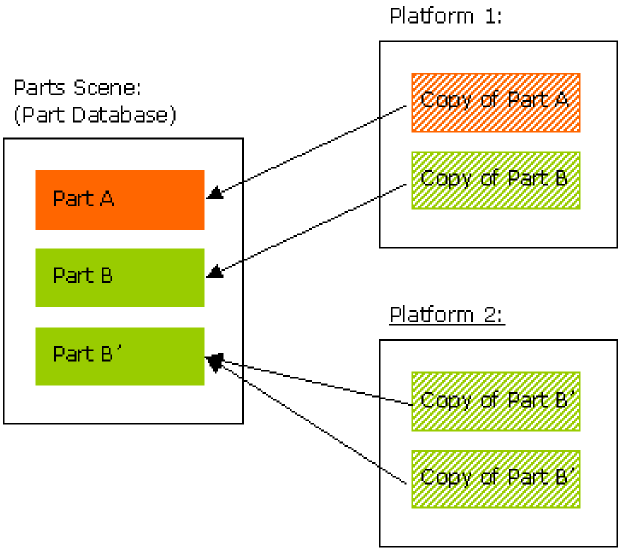
Magics will ask if you want to apply the changes only on the selected copy or on all virtual copies of part B present on platform 2:

If you apply the changes only on the selected copy, this is the result:




A new part is created in the part database. The edited copy will refer to a new real part.

If you apply the changes on all virtual copies of that mother part, this is the result:



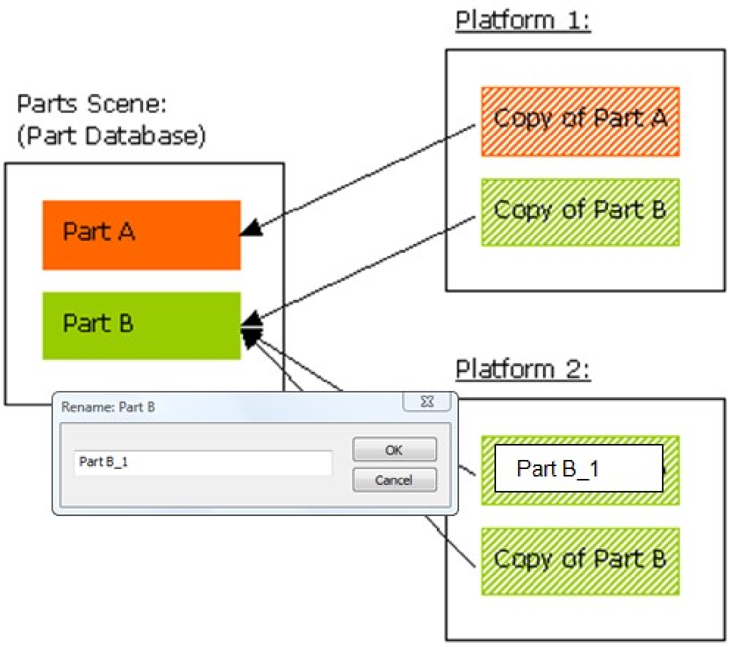
All the virtual copies of the same mother part, present on that platform, will refer to a new database part.

### 7.2.3 Naming of virtual copies

Virtual copies inherit the name of the mother part when it is created.

Within the platform scene however, virtual copies can be assigned with a unique/ different name.

***Example***




<u>Remark</u>:

- Editing virtual copies is only possible for virtual copies of the same mother part and present on the current platform! This is for safety reasons. If you want to edit all virtual copies of the same mother part, present on all the platforms, you should edit the STL files in the modeler scene.
- Names of virtual copies change when the name of the mother part (in the modeler scene) is changed. Even if virtual copies are already renamed. The part status however stays the same.

### 7.2.4 Advised ways of working

When you open Magics, the modeler scene will be present. A predefined scene also be opened by default if Magics opens. Choosing your default machines can be done in the machine library (see Edit machine properties, page 262).

If you use Magics mostly for platform independent operation e.g. fixing STL files or creating RapidFit, we advise you to work in the modeler scene.

If you use Magics mainly for preparing platforms, you can follow one of the following method of working.

Open Magics with the default Platform Scene or create a new Platform Scene. Make the Platform, where you want to work on, active – by clicking on the platform name in the main window.

Load or create a part. In the background this part will be loaded in the Modeler Scene (part database) and immediately a Virtual Copy of that part is created on the platform. You can edit and prepare this part in the Platform Scene, like you are used to in previous version of Magics. Each operation you do on the copy in the Platform Scene will automatically be performed on the real part in the Modeler Scene.

#### *7.2.4.1 Multiple Copies*

If you want to build more than one copy of a part on that Platform, you can duplicate the part (see Duplicate, page 87).

Most advised is to create the copies after you finished the preparation of the files. Otherwise, Magics will ask for each operation if you want to apply it on all copies or only on the selected ones. (If you select all copies, of course, the message won't be prompted).

#### *7.2.4.2 Hide Modeler Scene*

Because you can perform each operation on Virtual Copies, like you are used to on real parts in previous version of Magics, it can be less confusing when you hide the Modeler Scene. To hide the Modeler Scene, type "Modeler Scene" into the 'Quick search' bar and click on 'Modeler Scene'. To make the Modeler Scene reappear, repeat the previously mentioned process.

Method 2: Prepare files in the Modeler Scene and assign them to a Platform Scene.

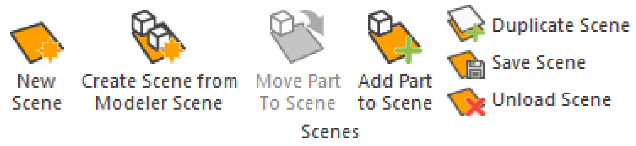
You can also work in the opposite direction. This means that you load all parts in the Modeler Scene, you prepare the files in the Modeler Scene and afterwards you assign the parts (read: create Virtual Copies) to the Platforms.

The disadvantage of this method is that you cannot perform machine dependent operations, e.g. translate to default position, in the Modeler Scene.

The advantage of this way of working is, when you need to edit a part that need to be built on different platforms, you only have to edit it once.

Of course, you can use a combination of these two methods, depending on what you want to do in Magics. Combining these two methods will give you the most added value, i.e. preparing your builds in a very fast and flexible way!

## 7.3 Scenes: Platform Operations

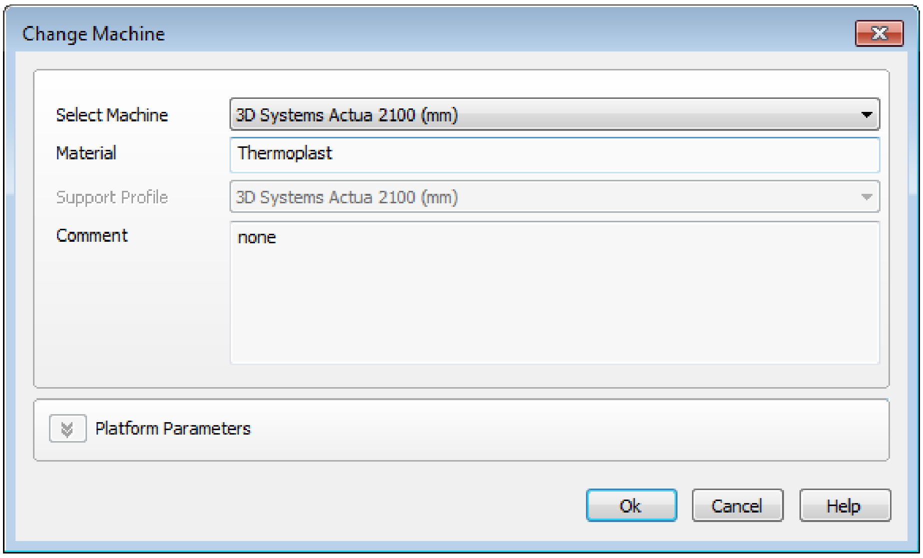



### 7.3.1 New Scene

With this function, you create a new Platform Scene in the main window. You have to choose the machine wherefore you want to create a Platform Scene.

It's also possible to select directly from this windows a specific support profile previously generated.

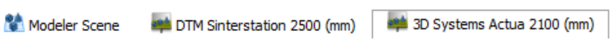
(See Support generation chapter on how to generate support profiles). The new Platform Scene will be open with selected support properties ready to be applied.



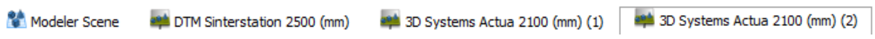

The new Scene will appear on the right of the present Platform Scenes.

If you create more than one platform for the same machine, the platform name will be the machine name extended with a number, e.g. '*3D Systems Actua 2100 (mm) (2)*'. You can organize machines via drag and drop.

*Original Situation*



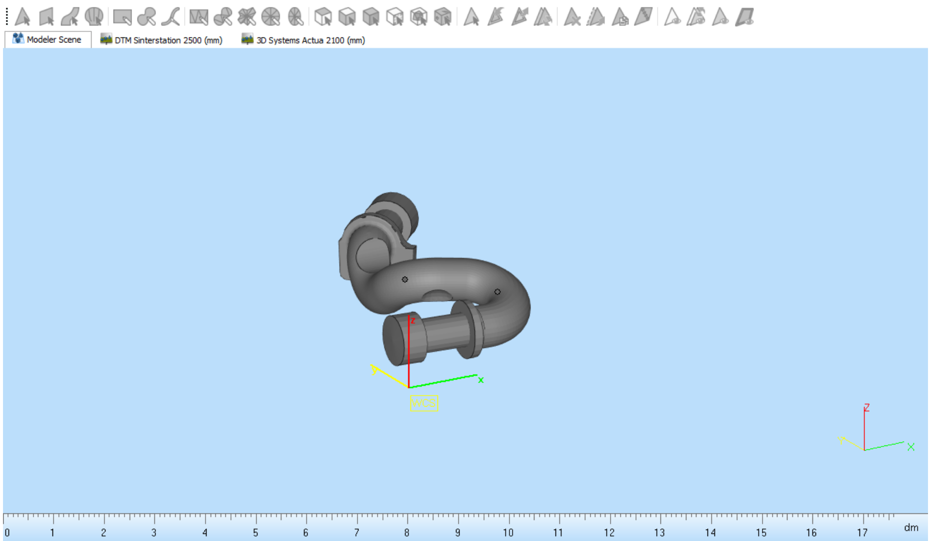
*Add New Scene*



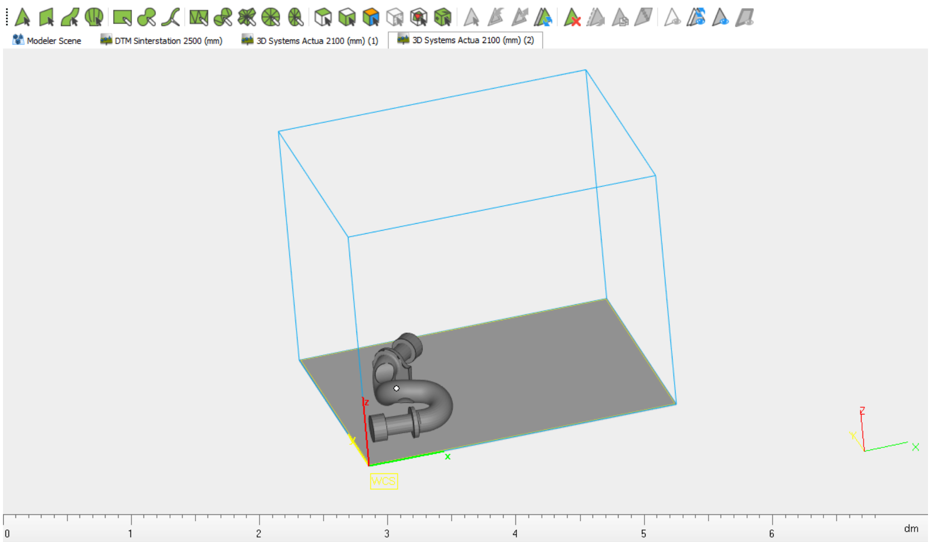

## 7.3.2 Create Scene from Modeler Scene


Firstly, you have to choose the machine wherefore you want to create a Platform. Then, for each of the parts present in the Modeler Scene, a Virtual Copy will be created on the current platform.

*Original Situation*



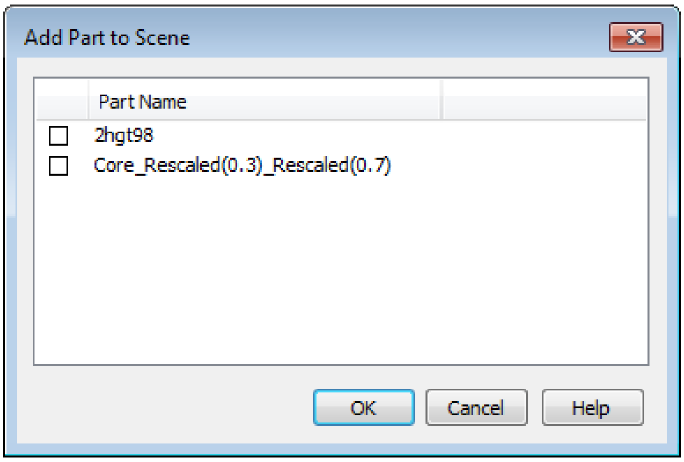

*Create Scene from Modeler Scene*



### 7.3.3 Add Part to Scene

This operation pops up a window showing all the parts loaded in the Modeler Scene. Here you can select from which of these parts you want to assign a virtual copy to the active Platform Scene.

If the parts you selected don’t fit to the platform or you have chosen a platform that is too small, a message will appear indicating a solution will be found but outside platform borders.



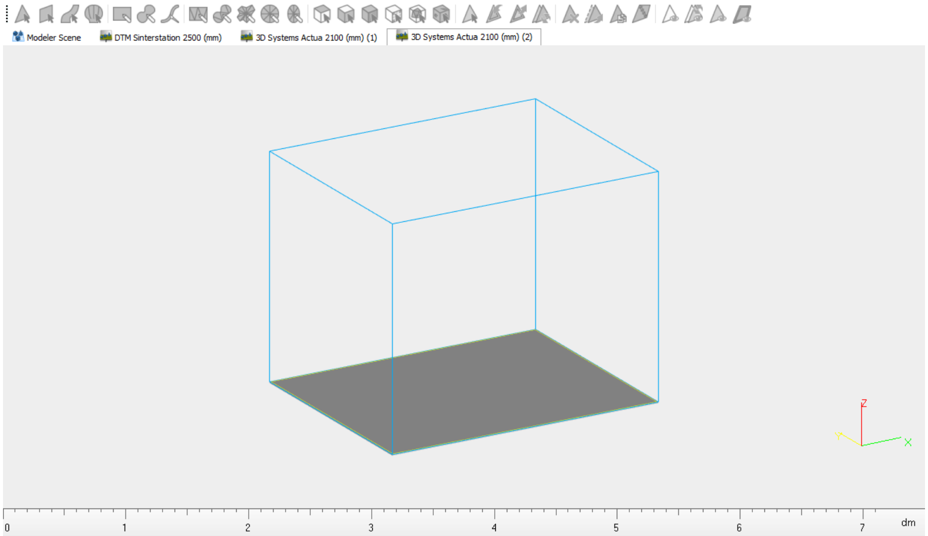

### 7.3.4 Move part to Scene

This function lets you easily move selected parts from the modeler scene to any of the loaded platform scenes. A platform machine dropdown list is shown with all available scenes.

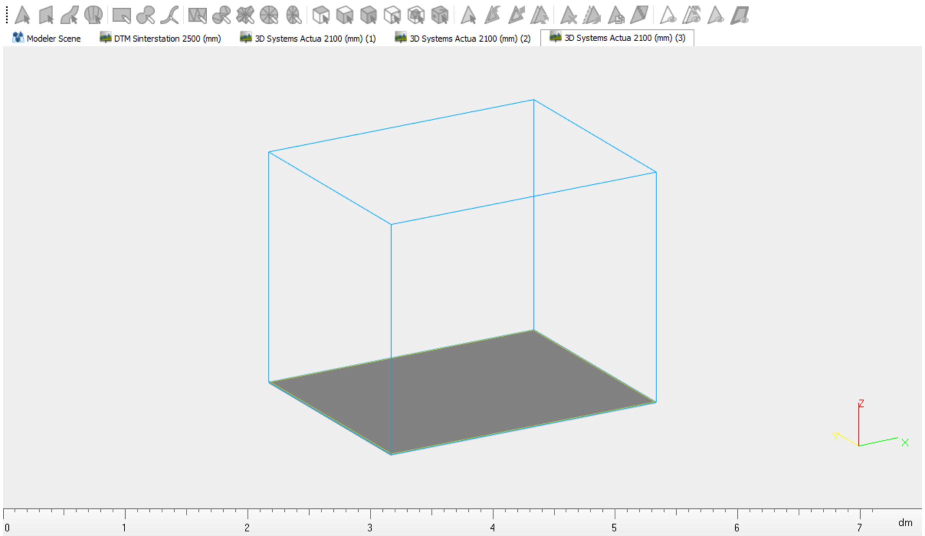
### 7.3.5 Duplicate Scene

This operation creates a Platform Scene, identical to the active Platform Scene. The Platform name will be the machine name extended with a number, e.g. ‘3D Systems SLA 250 (mm) (2)’.

*Original Situation*




*Copy Scene*



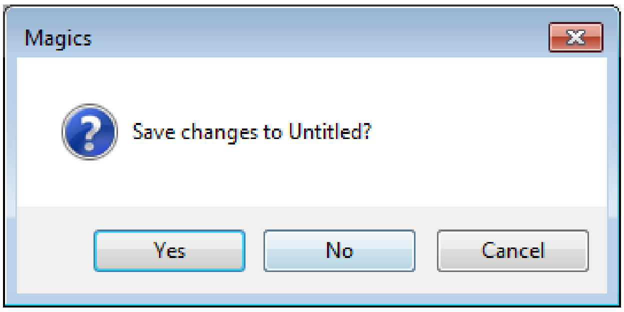

If the platform contains parts, also the parts will be copied on the new platform.

### 7.3.6 Save Scene

This operation pops up a ‘Save As’ dialog box in which you can change the name and destination of the project you want to save. The scene is saved with all positioned parts, measurements, …

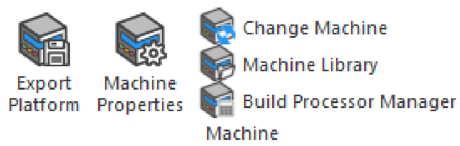
### 7.3.7 Unload Scene

With this operation you can unload the active Platform Scene. If there are virtual copies present on the current Platform Scene, Magics will pop up following dialog box:



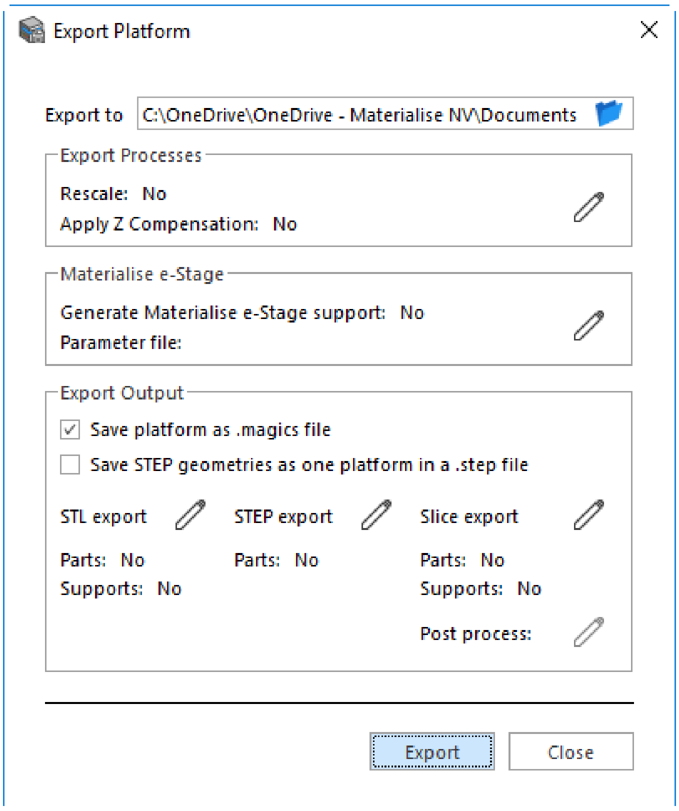

| | |
|---|---|
| Yes | Magics proposes to save all parts in a project file before unloading the scene. After saving all parts/ copies are unloaded. |
| No | The scene is unloaded without saving any parts/ copiers |

## 7.4 Machine




### 7.4.1 Export Platform


Exporting a platform slices the parts and the supports saved in the Magics project. This is the last step in work preparation. The result of the export platform operation is a file that can be sent to the RP-machine.



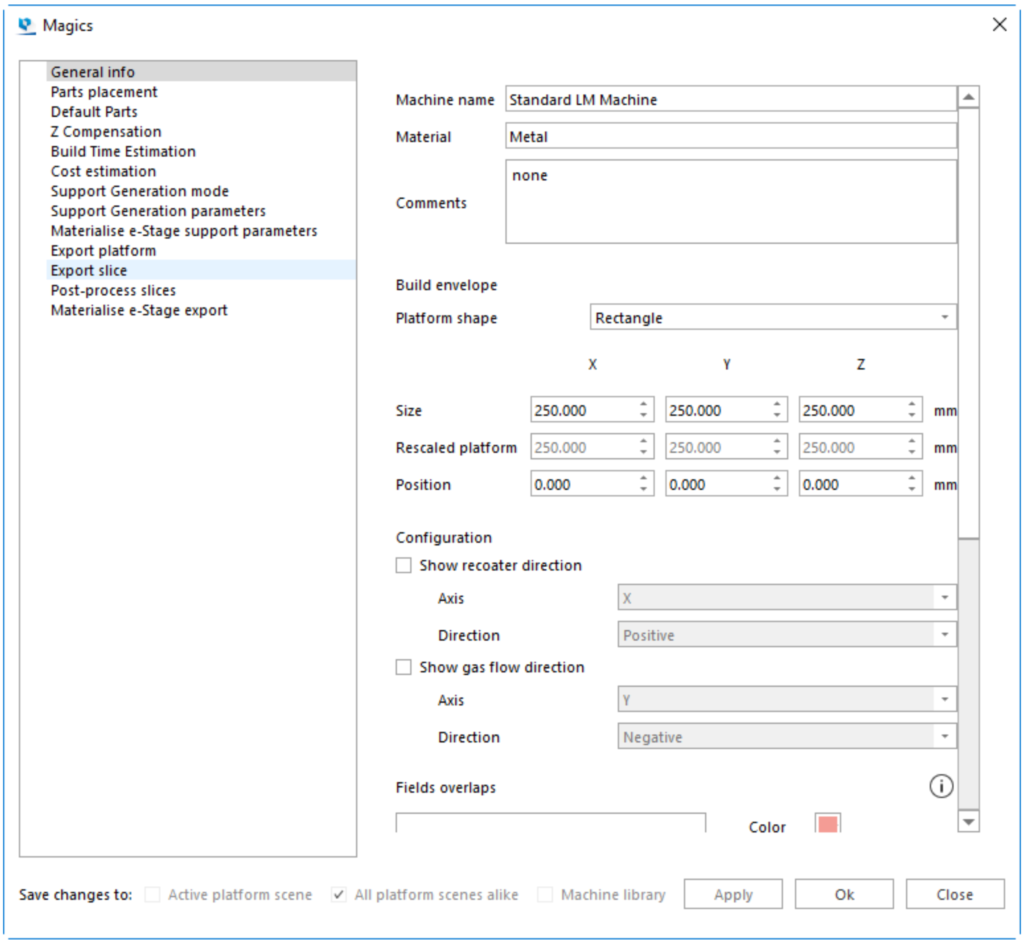

| | | |
|---|---|---|
| Export to | You can define the directory for the exported files. | |
| Export processes | An overview is given of the operation(s) which are performed during the export of the platform.<br>The export processes parameters are defined in the Machine Library – Export processes (see page 255 for more information) | |
| Materialise e-Stage | Materialise e-Stage is a separate software from Materialise, used to build fully automated and revolutionary support. Here you can define the profile that is used to generate automatic support during the export process. | |
| Export output | Automatically export all the files you need together with the platform file. | |
| | STL export | Export STL files for all parts and support present on the active scene. The parameters are defined in the Machine Properties/Export platform page (see page 255 for more information). |
| | STEP export | Export STEP files for all parts on the scene that contains a linked STEP geometry (see page 748 for more information). |
| | Slice export | Export sliced files for all parts and support present on the active scene. The parameters are defined in the Machine Properties/Export slice page (see page 256 for more information). |

*Remark*: The file name is based on the specified format in the 'Export Platform Working folder' setting.

### 7.4.2 Machine Properties


This function will pop up the Machine Properties dialog of the active Platform. The machine properties contain all the information related to the chosen machine type.

#### *7.4.2.1 General info page*




| | |
|---|---|
| Machine Name | Each machine type has to have a name. If you are building with different parameters, it is best to have a machine type for each set of parameters (e.g. layer thickness). |
| Material name | The material of the selected machine. |
| Comment | Comment on the selected machine. |

— Build envelope

| | |
|---|---|
| Platform Shape | The platform of the machine can be rectangular or circular. |



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| | |
|---|---|
| Size | The X, Y and Z values of the platform size. |
| Rescaled platform | When you choose to rescale parts during export of the platform, the size of the build envelope is automatically adjusted in the opposite direction. |
| Position | The minimum X, Y and Z values of the platform position. |

— Configuration

| | | |
|---|---|---|
| Show recoater direction | Enable the visualization of the recoater direction on the platform. This feature can be used for all machines presenting a recoater. | |
| | Axis | Specify along which axis the reacoter moves. |
| | Direction | Specify if the recoater moves from left to right, from right to left, or if it is a double-side recoater. |
| Show gas flow direction | Enable the visualization of the gas flow direction on the platform. This feature can be used for laser melting (LM) technology. | |
| | Axis | Specify along which axis the gas blows. |
| | Direction | Specify if the gas blows from left to right or from right to left of the specified axis. |

— Fields overlaps

| | |
|---|---|
| Overlaps list | Laser overlaps can be defined. Click on Add button to add an overlap that will be displayed on the platform, or select an existing overlap to edit it or delete it with the Delete button. |
| Color | The color used to visualize the overlap. |
| Axis | The axis of the overlap (X or Y axis of the platform). |
| Position | The position of the overlap. |
| Width | The width of the overlap. |

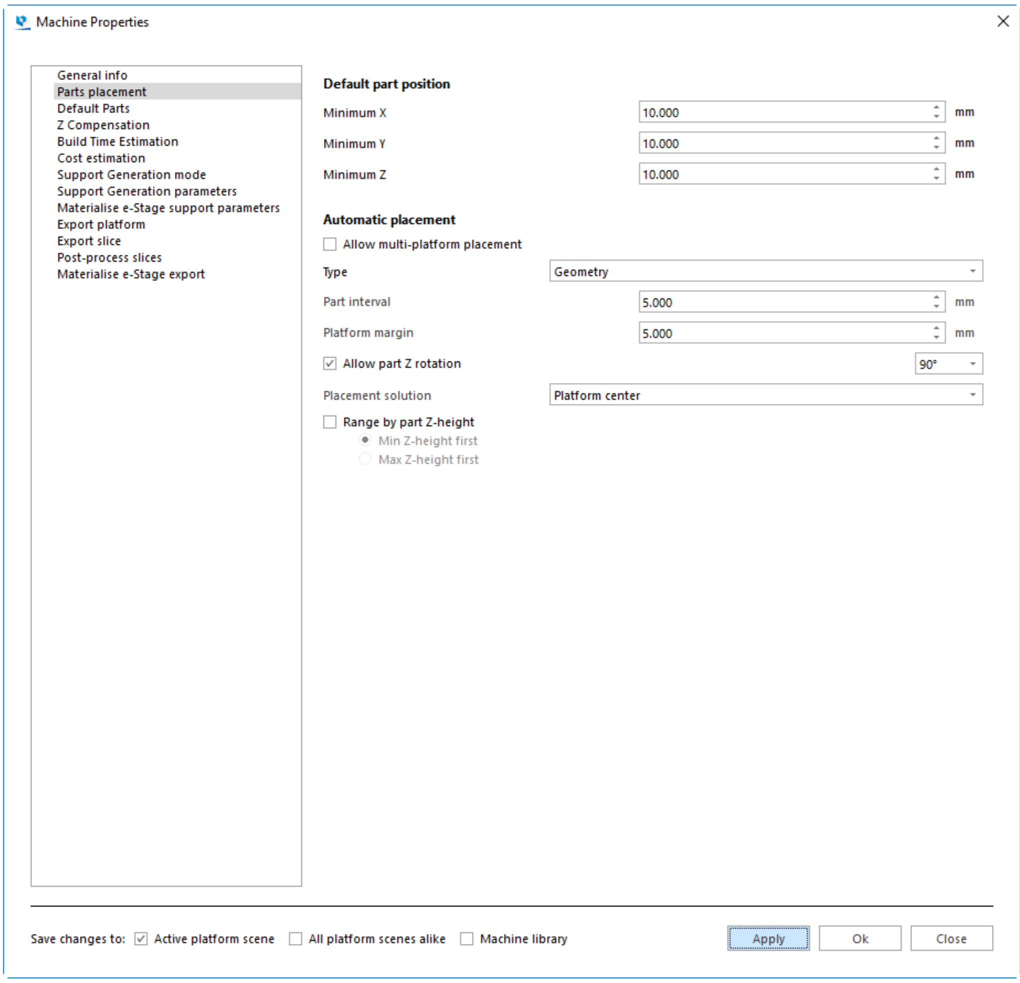
— Laser parameters

| | |
|---|---|
| Laser power | Intensity of the laser (W). |
| Ask for laser power when estimating | When this checkbox is selected, a specific value of laser power can be input at the moment of running the build time estimation. |
| Laser spot diameter | The diameter of the laser spot. |

— Slice visualization

| | |
|---|---|
| Slice position | Select on which position the slices represent the part: top, middle or bottom of the slice. |

### 7.4.2.2 Parts placement page

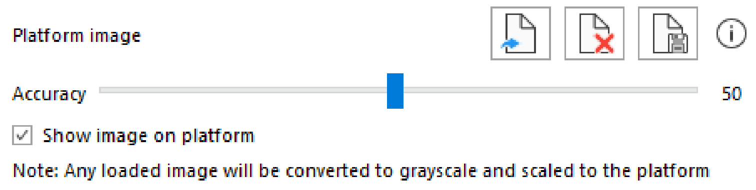



— Default part position

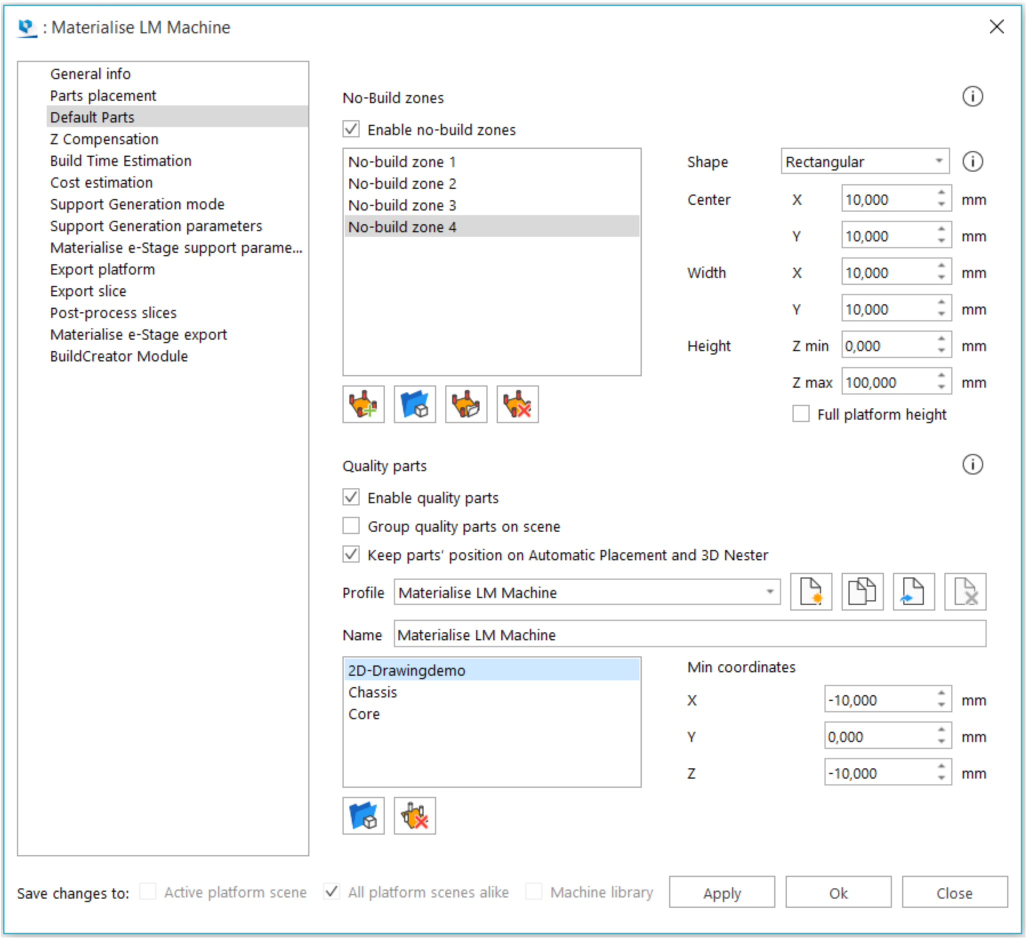
| | |
|---|---|
| Minimum X, Y and Z | Coordinates that a part has by default on the platform. |

— Automatic placement

| | | |
|---|---|---|
| Allow multi-platform placement | When this option is selected and the parts do not fit on the current platform scene, Magics will create as many platform as needed to place all parts. | |
| Type: Bounding box | Part interval | The interval between parts. |
| | Platform margin | The margin of the platform. |
| | Placement | The placement solution that will be applied:<br>— First solution<br>— Minimal XY area<br>— Minimal X area<br>— Minimal Y area |

| | | |
|---|---|---|
| | | — Platform center |
| | Range by part Z-height | When this option is selected, parts will be placed accordingly to their Z height; it is possible to start from the part with highest value or lowest value of Z height. |
| Type: Geometry | Part interval | The interval between parts. |
| | Platform margin | The margin of the platform. |
| | Placement | The placement solution that will be applied:<br>— First solution<br>— Minimal XY Area<br>— Minimal X area<br>— Minimal Y area<br>— Platform center<br>— Custom solution* |
| | Allow part Z rotation | When checkbox is deselected, parts are only translated; when checkbox is selected, parts are translated and rotated of the specified angle during automatic placements. |
| | Range by part Z-height | When this option is selected, parts will be placed accordingly to their Z height; it is possible to start from the part with highest value or lowest value of Z height. |
| | *Custom solution options | <br>Load an image that can be shown on the platform: the loaded image will be first converted to grayscale and then scaled to fill the platform.<br>The darker areas of the image indicate higher priority, while the lighter areas indicate lower priority.<br>Export the Platform image to get an image with the correct platform dimensions, that you can immediately edit.<br><br>Note: lower accuracy will be faster, but the image used for the positioning of parts will be less detailed. Higher accuracy will give a more detailed image, but might be slower. |

### 7.4.2.3 Default parts page




— No-Build zones

With the No-Build zone functionality you can indicate areas in which you don't want to build parts. These areas will be taken into account during nesting or automatic placement operations.

This feature can be useful in different situations. (e.g. metal machines, multiple lasers, …)

| | | |
|---|---|---|
| Enable no-build zones | Activate and visualize the no-build zones on the platform. | |
|  Add zone | Create a new no-build zone with default shapes (cylindrical or rectangular). | |
|  Import part as zone | Import STL files to have customized shapes of no-build zones. More complex shapes can be used. | |
| | Min coordinates | The X, Y and Z coordinates are used to define the position of the STL on the platform. The minimum point of the part bounding box (for all axes) will be translated to the specified coordinates. |

| | | | |
|---|---|---|---|
|  Load zones from another machine | Load no-build zones from another machine with defined no-build zones. | | |
|  Delete zone | Delete the selected no-build zone from the list. | | |
| Shape: Cylindrical | Center | X, Y | The X and Y coordinates are used to define the center point of the cylinder section. |
| | Radius | Define the radius of the cylindrical no-build zone. | |
| | Height | Define the height of the cylindrical no-build zone. | |
| | | Z Min | The starting height of the no-build zone. |
| | | Z Max | The ending height of the no-build zone. |
| | Full platform height | The no-build zone is active for the full height of the build envelope. 'Height' will be disabled when choosing 'Full platform height'. | |
| Shape: Rectangular | Center | X, Y | The X and Y coordinates are used to define the center point of the rectangle section. |
| | Width | X, Y | Define the size of the rectangular no-build zone. |
| | Height | Define the height of the rectangular no-build zone. | |
| | | Z Min | The starting height of the no-build zone. |
| | | Z Max | The ending height of the no-build zone. |
| | Full platform height | The no build zone is active for the full height of the platform build envelope. 'Height' will be disabled when choosing 'full platform height'. | |

— Quality parts

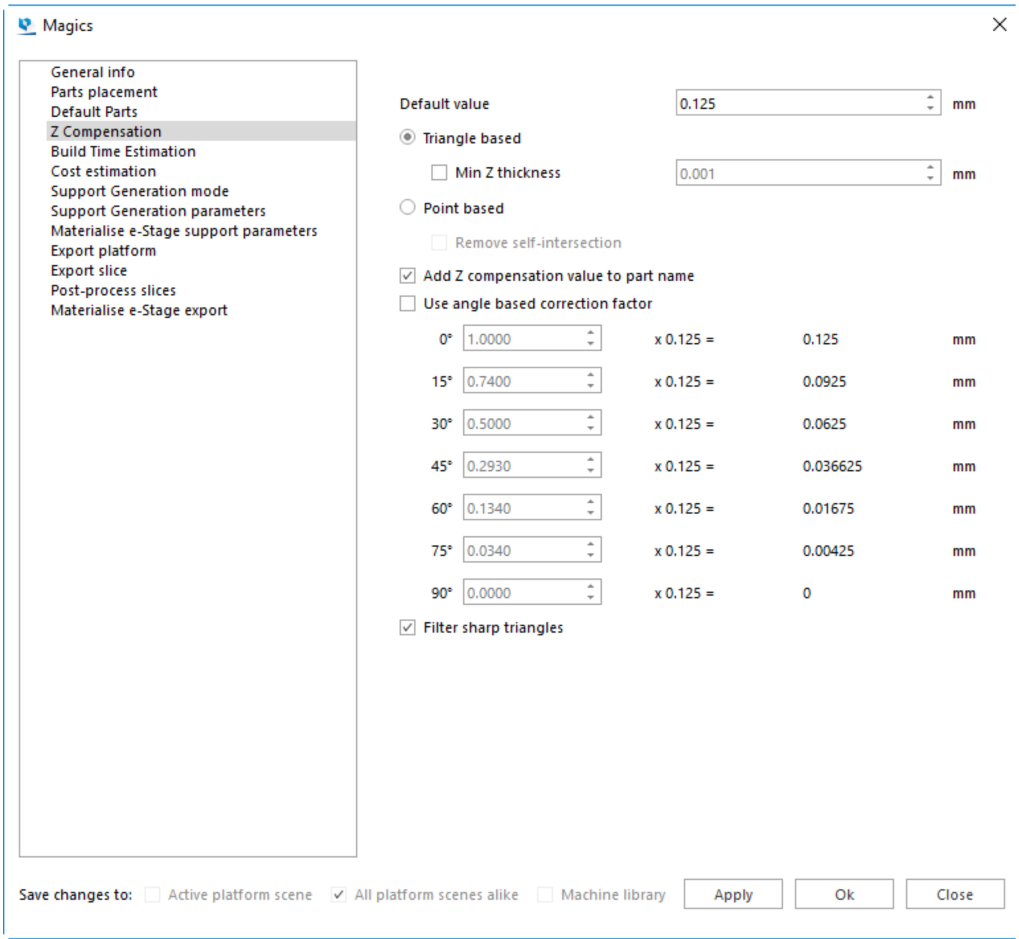
In the Quality parts tab you are able to define models that will be loaded automatically when opening a new scene. The position of these models can be specified.

| | |
|---|---|
| Enable quality parts | Activate and visualize the quality parts on the platform. These parts are also added to the Part list. |
| Group quality parts on scene | All quality parts added will be grouped in one group. |
| Keep parts position on Automatic Placement and 3D Nester | Quality parts will remain in their position defined in Machine properties when running Automatic Placement or 3D Nester. |
| Profile | Select and manage the profiles of quality parts. |

| | | |
|---|---|---|
| | Create new profile | Click this button to create a new profile. |
| | Duplicate profile | Click this button to create a copy of the current profile. |
| | Load profile from another machine | Click this button to load an existing profile from another machine. |
| | Delete profile | Click this button to delete the current profile. |
| | Name | Type the name of the profile. |
|  Import part | Create a quality part by importing an *.stl or a *.matpart file. When using *.matpart files, you are able to retain label planning information and support structures that are saved in the part loaded. | |
| | Min coordinates | The X, Y and Z coordinates are used to define the position of the quality part on the platform. The minimum point of the part bounding box (for all axes) will be translated to the specified coordinates. |
|  Delete part | Delete the selected quality part from the list. | |

*7.4.2.4 Z-Compensation page*

For models built with Stereolithography and Laser Sintering, overcure may cause extra material to build up on down-facing surfaces. To avoid the time-consuming process of manually correcting these errors after the part is finished, the Z-Compensation function can be used.



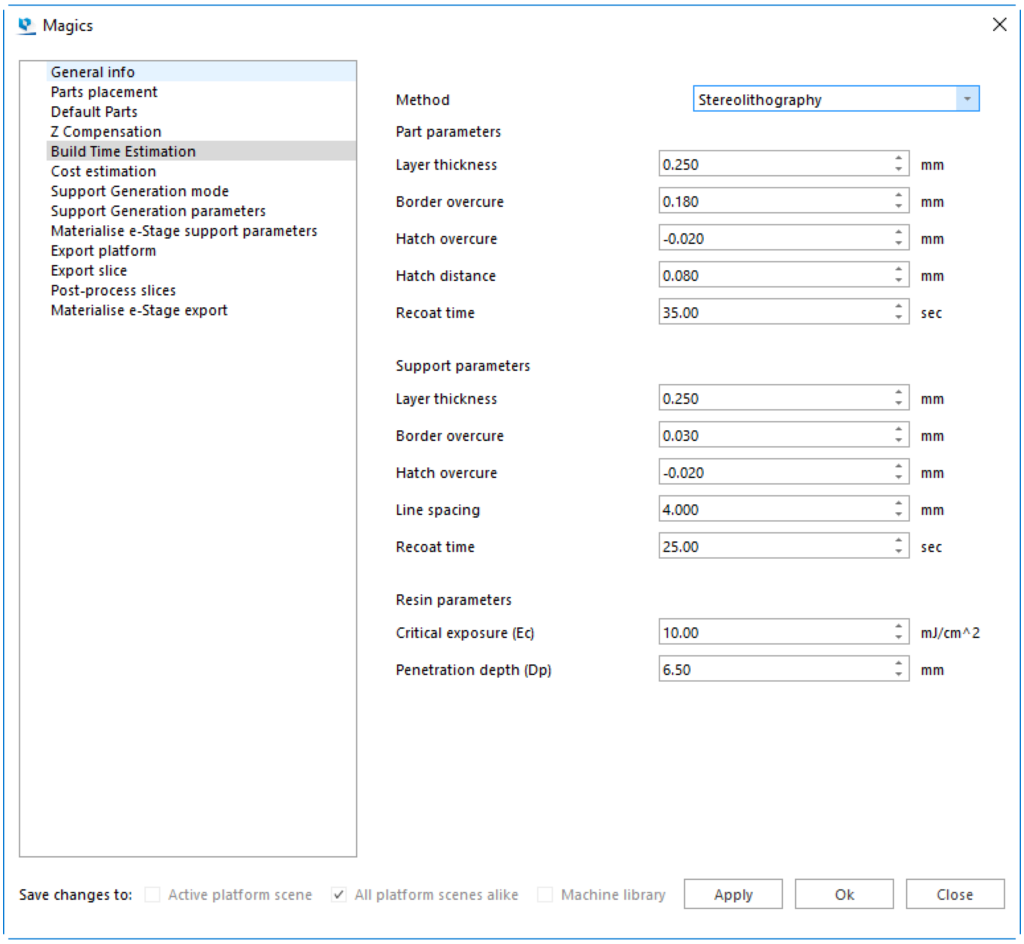

| | |
|---|---|
| Default Value | The value that is displayed by default when the user applies a Z-compensation on a part located on the respective platform. |
| Advanced Options | When you prefer to perform Z-compensation during export, you can choose the Z-compensation algorithm (see Z-Compensation, page 264) |

### *7.4.2.5 Build time estimation page*

There are 2 methods available for the build time estimation: the first one is focused on Stereolithography technology, while the second one uses a self-learning algorithm that is based on teaching platform data that you can add over time.

*Remark:* The laser parameters defined in the General info page (pag. 242) will be taken into account during the build time estimation.

### 7.4.2.5.1 Stereolithography method




— Part parameters

| | |
|---|---|
| Layer thickness | The thickness of the layers. |
| Border overcure | The overcure of the border. |
| Hatch overcure | The overcure of the hatching. |
| Hatch Distance | The interval distance of the hatchings. |
| Recoat Time | The time needed to put a new layer of resin/powder on top of the already made construction. |

— Support parameters

| | |
|---|---|
| Layer thickness | The thickness of the layers. |
| Border overcure | The overcure of the border. |
| Hatch overcure | The overcure of the hatching. |
| Hatch Distance | The interval distance of the hatchings. |
| Recoat Time | The time needed to put a new layer of resin/powder on top of the already made construction. |

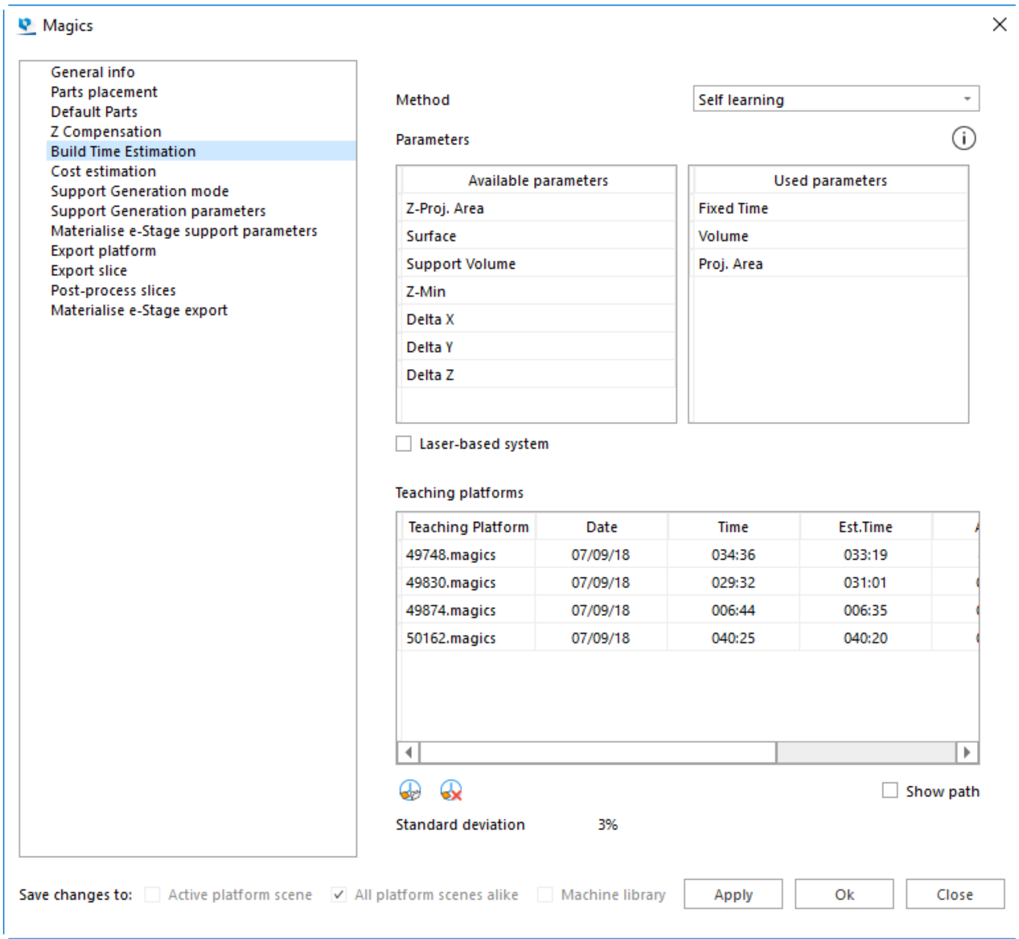
— Resin parameters

| | |
|---|---|
| Critical exposure (Ec) | The critical dose of energy. |
| Penetration depth (Dp) | The curing depth of the laser. |

### 7.4.2.5.2 Self-learning method

The self-learning method requires a list of teaching platform files. These platforms should be actually built on the machine, thus providing real information of printed builds. Putting together such a list will allow Magics to accurately estimate the build time of new platforms.

The platform and the appropriate parameters used to calculate the build time must be selected.




— Parameters

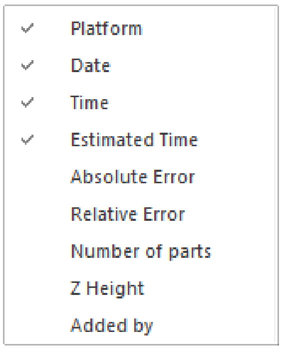
The two parameters lists show you the parameters that can be used for build time calculation of a platform. The list on the left contains all the parameters that may be included in the build time calculation, while the list on the right contains the parameters that will be included in the calculation. You can drag and drop parameters from one list to the other.

When the Laser-based system checkbox is selected, one extra option will appear on the Used parameters list; you can decide if the specific parameter depends or not on the laser power by flagging it in the Laser-based column.

Note: You should have at least as much teaching platforms as there are parameters.

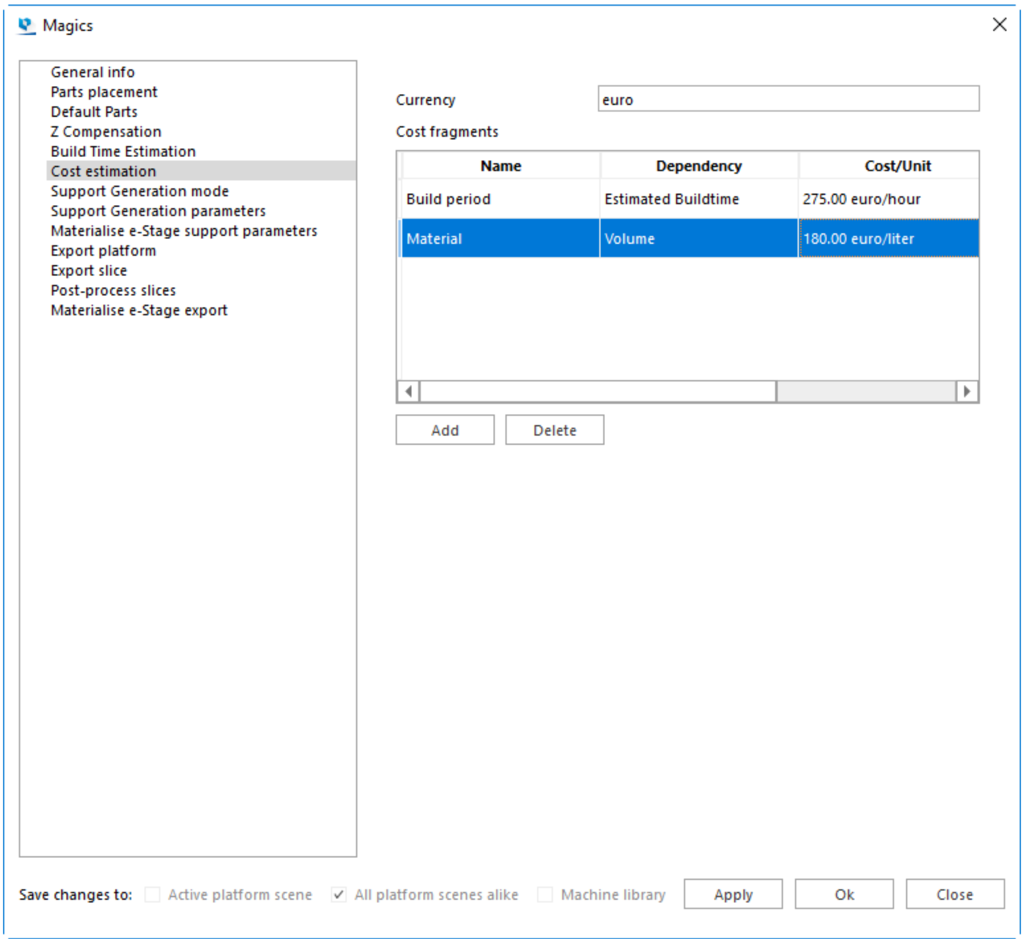
— Teaching platforms

Here you can visualize and manage the data of your teaching platforms used for the build time estimation calculations.

| | |
|---|---|
| Platform | The file name of the Magics project used as a teaching platform. |
| Date | The value corresponds to the date when the teaching platform has been imported. |
| Time | Insert the real build time of the teaching platform (hours and minutes). Double click on the field to edit the value. |
| Estimated time | The value corresponds to the estimated build time of the teaching platform. |
| Absolute and Relative errors | The absolute and relative errors give the statistical errors between the estimated and the actual build time of the teaching platform. Absolute error is difference in hours and minutes, while the relative error is expresses as a percentage of the real build time. |
| Extend list with additional data | You have the possibility to add or remove additional columns; right mouse click on the table headers to display a list of additional columns.   |
| Import platform | Click on this icon to import a Magics project as a teaching platform. |
| Delete platform | After selecting one or more teaching platforms from the list, click on this icon to delete the selected teaching platform(s) from the list. |
| Show path | Select this option to display in the Platform column the file path instead of the Magics project file name. |
| Standard deviation | This values is related to all the relative errors of the teaching platforms added to the table; it gives an idea of the average deviation of the value resulting from the build time estimation compared to the real build time. |

### 7.4.2.6 Cost estimation page

Cost estimation is a primary need of a company. The cost estimation is done in the tools menu and is done based on parameters which are machine dependent and thus are defined in the Machine Properties.




The Currency can be entered at the top of the page. A cost can be added, edited or removed. To edit a cost fragment, just double-click on the desired field in the table.

- You can give the cost a name (appears in the column Name)
- The dependency determines the variable of the cost. It can be one of the following list. In the first column, you find the dependency, in the second column you find the unit in which this parameter is expressed.

| *Dependency* | *Unit* |
|---|---|
| Estimated Build Time | Hour |
| Fixed Cost | Platform |
| Volume | Liter |
| Support Volume | Liter |
| Surface | $cm^2$ |
| Delta X | mm |

| | |
|---|---|
| Delta Y | mm |
| Delta Z | mm |
| Number of STL Files | Part |
| Bounding Box Volume | Liter |

— Define the cost per unit for each fragment

*Remark*: When you choose Estimated Build Time, the build time has to be calculated as well and thus all the parameters for these calculations have to be correct. Magics will also ask you for the laser power.

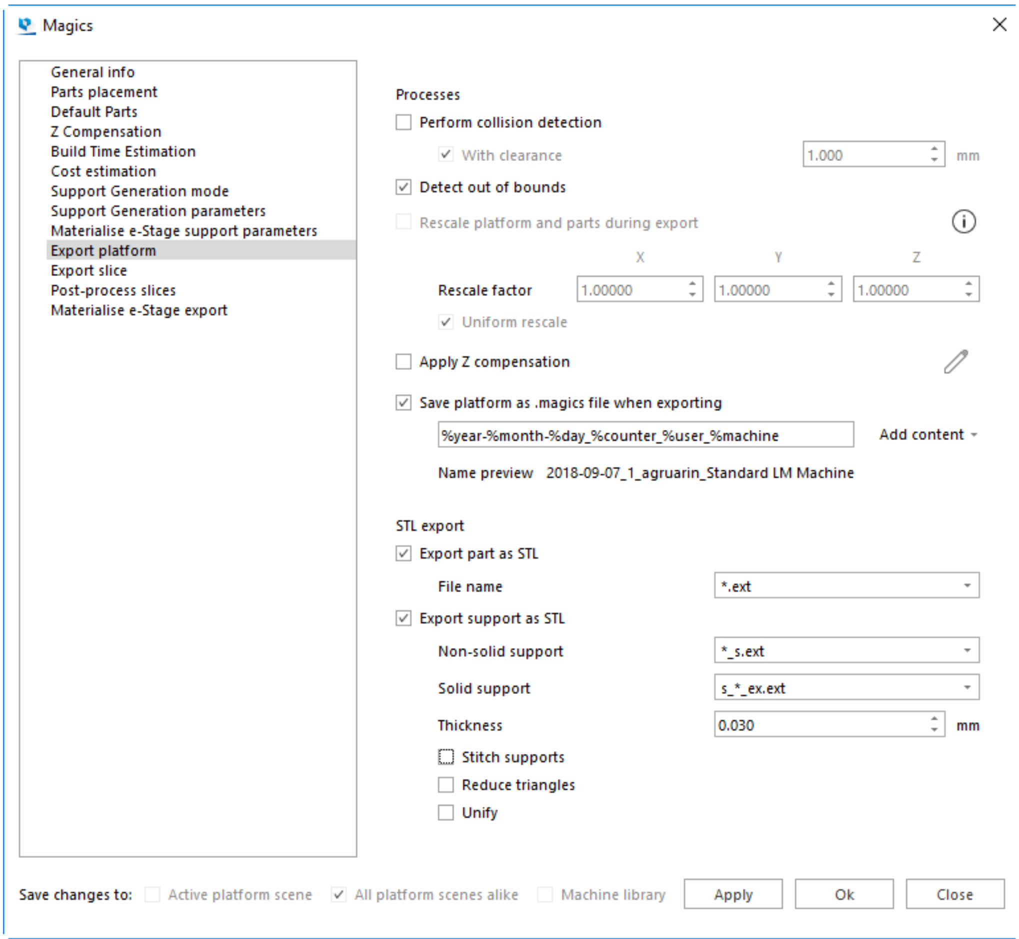
#### *7.4.2.7 Support Generation mode*

— See 3.5 Support Generation Mode, page 519.

#### *7.4.2.8 Support Generation parameters*

— See 3.6 Support generation parameters, page 520.

### *7.4.2.9 Export platform page*




— Processes

| | | |
|---|---|---|
| Perform collision detection | During export colliding parts can be detected. | |
| | With clearance | Use a defined clearance to detect collision between different parts. |
| Detect out of bounds | When selected, a check is performed to see that all parts within the platform scene are included within the platform bounds. | |
| Rescale platform and parts during export | When exporting, platform and parts can be rescaled by a given factor. (See Rescale for more information) | |
| Apply Z compensation | You can apply Z compensation when exporting. | |
| Save Platform as .magics file when exporting | When exporting the platform is saved as a magics file.<br>Define the naming template by adding the predefined tags; you can see a preview of the resulting name for the current platform. | |

— STL export

| | | |
|---|---|---|
| Export part as STL | When selected, the part is exported as STL. | |
| | Filename | Choose a default name convention. |

| | | |
|---|---|---|
| | | Note: when saving the part, the symbol * is replaced by the part name |
| Export support as STL | When selected, the support is exported as STL. This also includes e-Stage supports. | |
| | Non-solid supports | Choose a default name convention for non-solid supports |
| | Solid supports | Choose a default name convention for solid supports |
| | Thickness | Define the thickness of your support. |
| | Stitch supports | A stitch operation is performed on the support before exporting, in order to reduce the bad edges. |
| | Reduce triangles | A triangle reduction is performed before exporting, in order to reduce the amount of triangles |
| | Unify | A unify operation is performed before exporting. |

### *7.4.2.10 Export slice page*

More information can be found under the 'Slicing' module.

— See Machine Setup, page 741

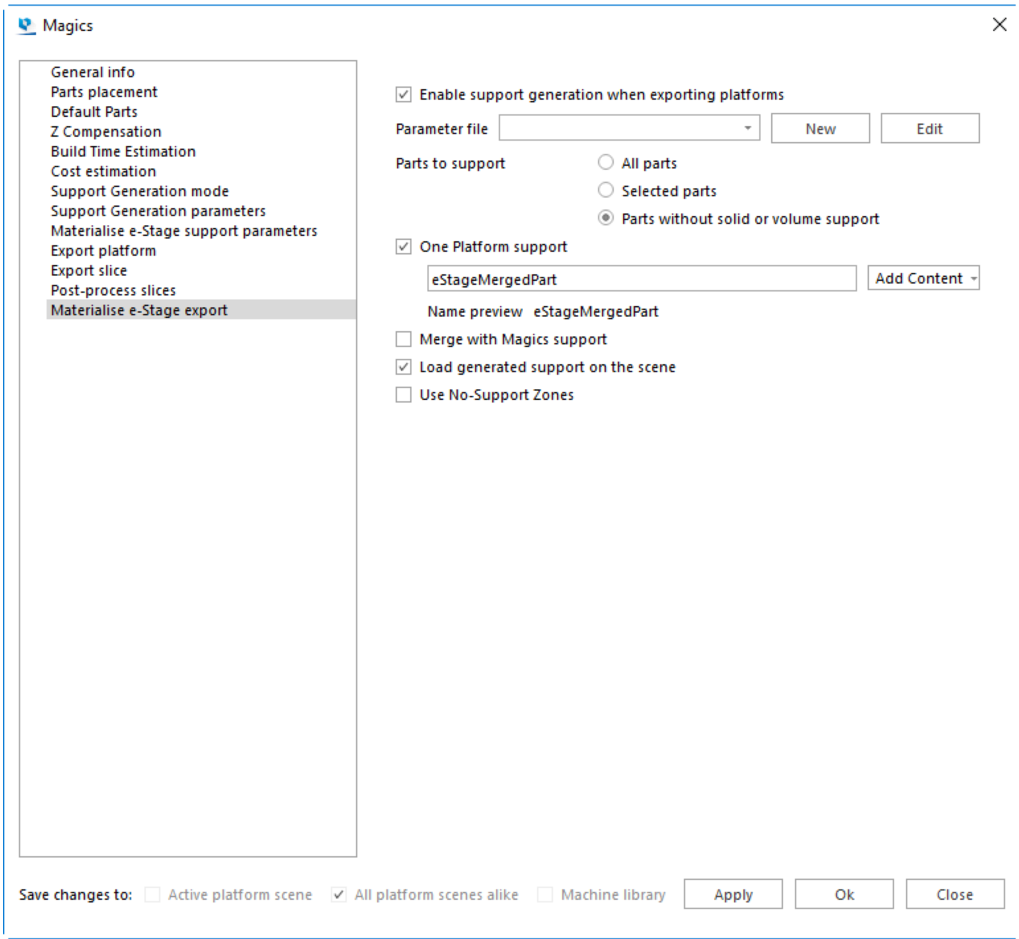
### *7.4.2.11 Post-process slices page*

More information can be found under the 'Slicing' module.

— See Post-process slices page, page 742

### *7.4.2.12 Materialise e-Stage export page*

Materialise e-Stage is a separate program used to build fully automated and revolutionary support. In Magics it is possible to activate Materialise e-Stage as an export process. You can find it therefore as an option in the machine properties. Each machine can have its own Materialise e-Stage parameter set. More information of the parameters, you can find in the manual of Materialise e-Stage itself.



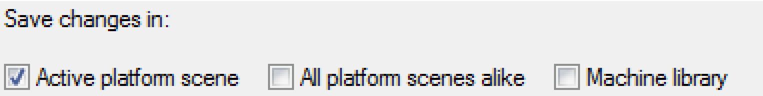

| | | |
|---|---|---|
| Enable support generation when exporting platforms | When selected, it activates Materialise e-Stage as an export process. | |
| Parameter file | A dropdown menu gives you the possibility to choose an e-Stage *.par file from the e-Stage parameter folder defined in the Magics Settings. | |
| | New | The e-Stage parameter window opens with the default e-Stage parameters. By default the parameter editor will propose to store the file in the e-Stage parameter folder. You can save it somewhere else but in that case you will not be able to select it in Magics. |
| | Edit | The selected parameter file opens in the e-Stage parameter window. |
| Parts to support | Define which parts of the platform will be supported by e-Stage support.<br>— All parts<br>— Selected parts<br>— Parts without solid or volume support | |
| One platform support | One platform is exported including all the supports. | |
| | Naming template | Add the content which has to be displayed in the project name. |

| | | |
|---|---|---|
| | Preview | A preview is shown of the naming for .magics files that are created via the export platform functionality |
| Merge with Magics support | Parts are merged together into one part before the parts are sliced. | |
| Load generated support on the scene | The generated support is loaded into Magics as an STL part. | |
| Use No-Support Zones | When this checkbox is selected, areas that are indicated as No-Support Zones will not be supported by e-Stage support. | |

*Remarks*:

- If you want to open a .par file that is older than your e-Stage version, a dialog box will pop up. When you want to update your e-Stage par file, the e-Stage parameter window will open with the parameters found in the file and the absent parameters with the default values from e-Stage.
- If you want to open an e-Stage .par file that is newer then your e-Stage version, a dialog box will pop up. A message is shown that your e-Stage version cannot load this e-Stage par file.

#### *7.4.2.13 Save changes in*




| | |
|---|---|
| Active Platform Scene | Changes made in the machine properties are only saved in the active platform scene |
| All Platform Scenes Alike | Changes made in the machine properties will be saved for all active platform scenes. |
| Machine Library | Changes made in the machine properties are saved in the machine library. |

*Remark*: To have a clear overview of all used parameters per machine a report can be generated.

(File > Generate Report > ‘Select the template corresponding with the used version of office’ >Machine properties report)

### 7.4.3 Change Machine


If you want to change the machine of the active Platform Scene, you can do this with this operation. The Select Machine dialog will pop up and you can choose another machine and another support profile for this machine.

## 7.4.4 My Machines

My Machines The My Machines command is meant to setup Magics for the user's RP-machine. As a user you can choose to use one of the available machines or specify your own machine.

The machine selection consists out of two lists:

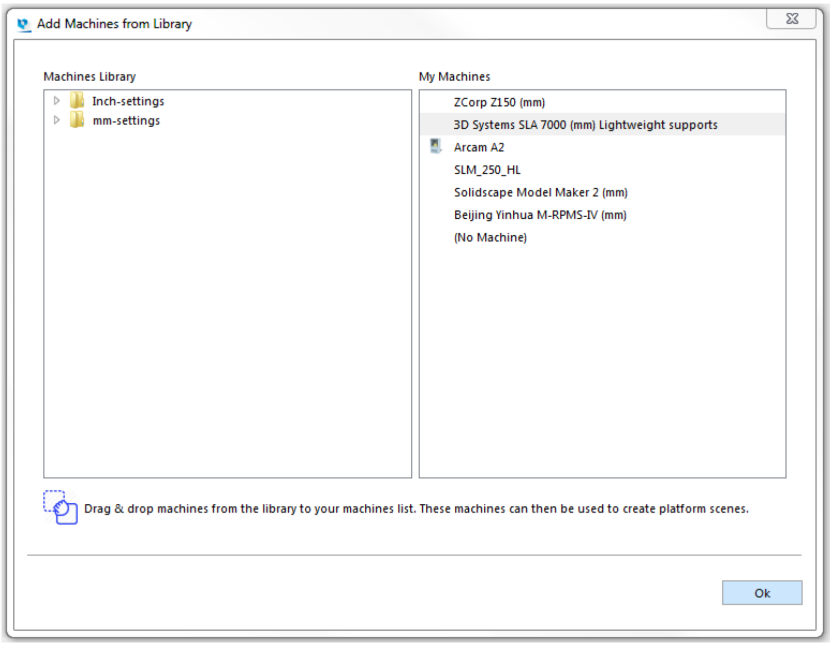
- My Machines: The machines that are used by the user, they are stored in a designated folder. This folder allows adding, copying, deleting and editing the parameters of the machines.
- Machine Library: This is a list of all machines installed in Magics. To edit the parameters of these machines, the user needs to first copy them to the folder "My machines".
-

The "My Machines" – list is empty in the beginning, and the user has to define the desired machines to work with. The user must add machines from the "Machine Library". Once added in the "My Machines" – list, the user can:

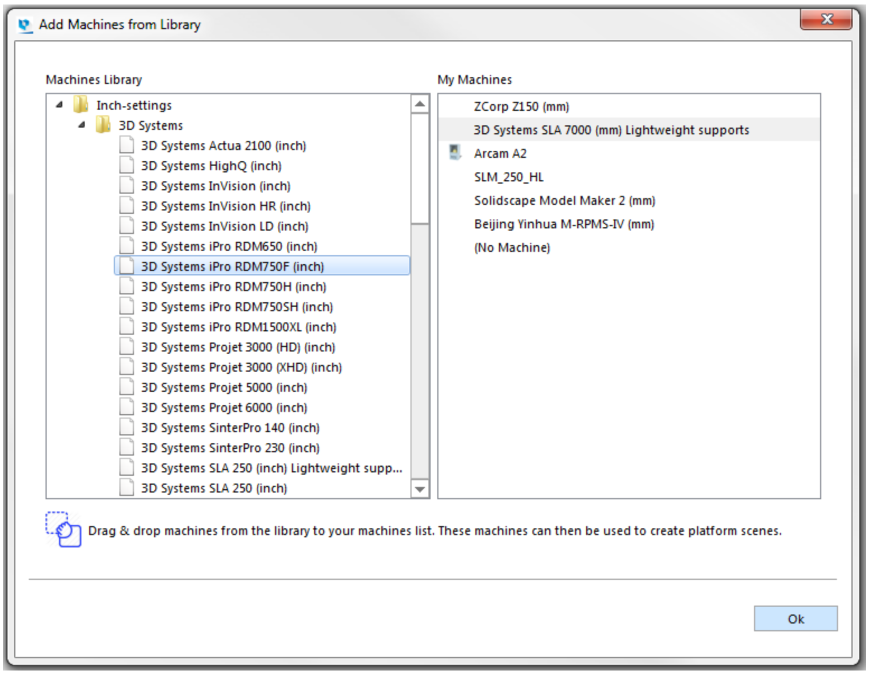
- Change the parameters (includes renaming) of the machines
- Copy the machines
- Delete machines

### *7.4.4.1 Advised way of working*

1. The first time you want to use the Machine Library, the list is empty. The user must add machine files from the "Machine Library" to the "My Machines" via Add from Library. The following dialog pops up:

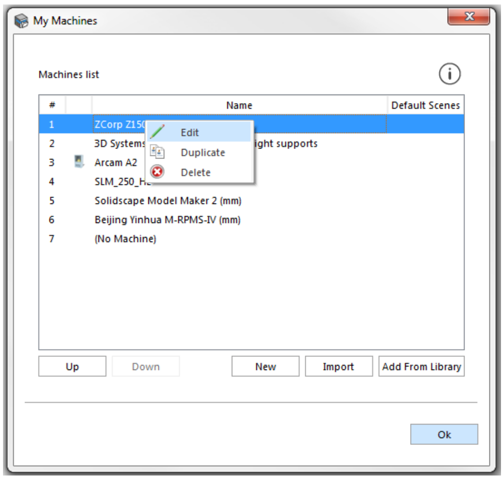


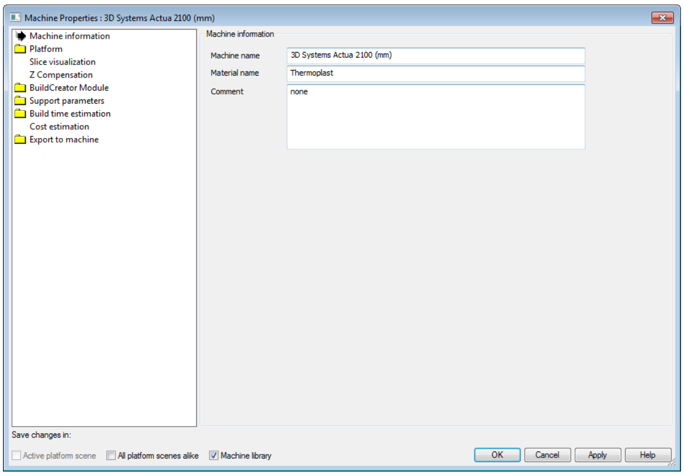

2. The user selects the required machines by browsing the predefined list in the "Machine Library"



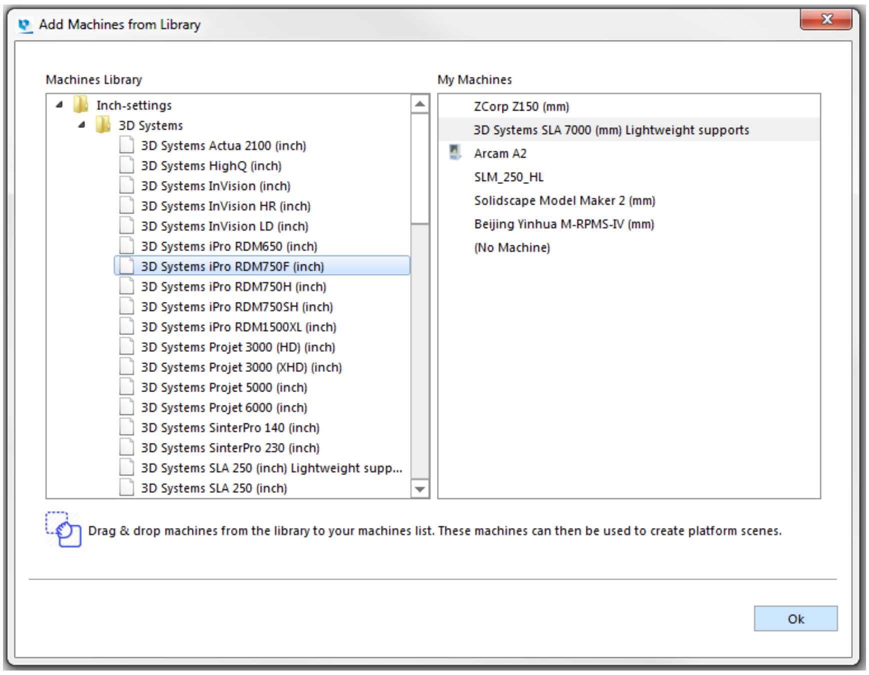

3. The machines are copied to the “My Machines” list by drag & drop.

4. Now, the user can perform the desired modifications on the machines present in the list by clicking the right mouse button on the desired machine and selecting ‘Edit’.



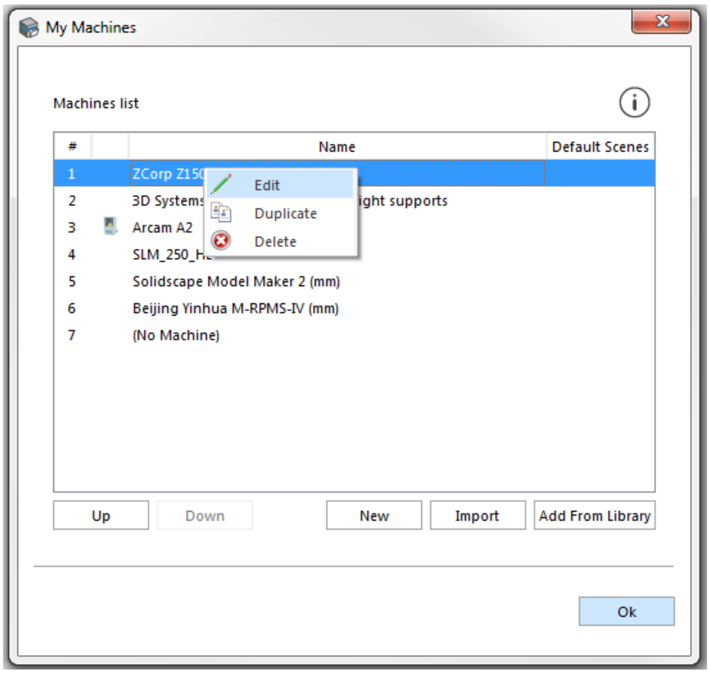
#### 7.4.4.1.1 Add machines from library




The Machine library is structured in folders:

- Mm-files
- Brands
- List of all machines made by the manufacturer
- Inch-files
- Brands
- List of all machines made by the manufacturer

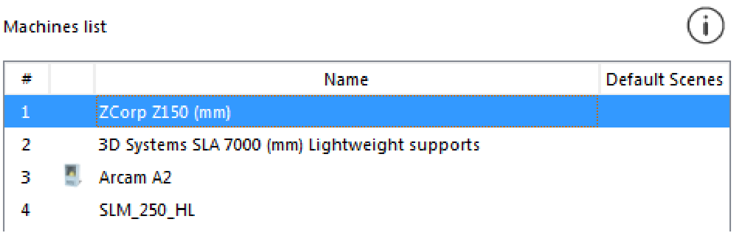
### 7.4.4.1.2 Edit machine properties




By clicking the right mouse button on a specific machine, the user access a contextual menu where he can:

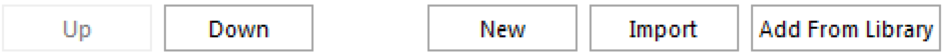
- Edit the parameters of the machine: the Machine Properties dialog will be shown, where user is able to define the machine properties.
- Duplicate the machine: the selected machine will be copied to the “My Machines” list, and a new unique machine name is asked. Duplicate enables to create new machines based upon the selected one.
- Delete the machine: the selected machine can be removed from the “My Machines” list. Confirmation about this action is asked.
-

The top side of the dialog contains the “My Machines” list, while at the bottom user can find controllers for the table.



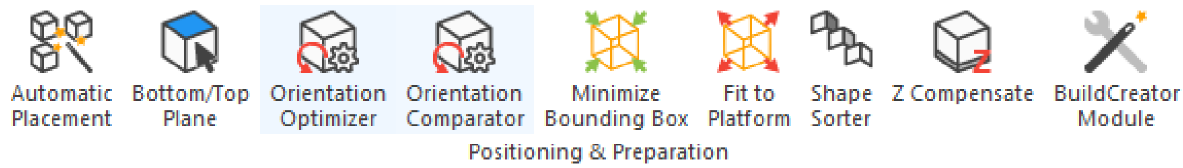

| | |
|---|---|
| # (Priority) | This value defines the position of the machine in the list. The order defined here will be used when displaying the machines list in other Magics functions (e.g. Change Machine, see page 258)<br><br>Double click the left mouse button to change value, or simply drag and drop a machine in the desired position. |

| | |
|---|---|
| | When a machine icon is displayed, that machine is a Build Processor machine. |
| Name | It displays the name of the machine. To change it, double click the left mouse button on the machine name and simply type the new name. |
| Default scenes | Define how many scenes of a certain platform you would like to load automatically when starting a new project of Magics.<br>Double click the left mouse button to change value. |




| | |
|---|---|
| Up | Move the selected machine one position up in the priority order. |
| Down | Move the selected machine one position down in the priority order. |
| New | Create a completely new machine based on default parameters. |
| Import | It allows the user to import machine files. The opened dialog box filters on *.mmcf files. |
| Add from Library | It opens up the Add Machines From Library dialog, so the user can add new machines to the “My Machines” list. |

## 7.5 Positioning & Presentation




### 7.5.1 Automatic Placement


This command will nest the loaded parts on the building platform.

— See Automatic placement, page 203

### 7.5.2 Bottom/Top Plane

This command allows easy orientation of the part by indicating a plane as the bottom/top plane. This plane will be automatically oriented parallel to the platform.

— See Bottom/Top Plane, page 201

### 7.5.3 Orientation Optimizer

The orientation optimizer tool was designed to help in analyzing and providing the best orientation for your part.

— See Orientation optimizer, page 211

### 7.5.4 Orientation Comparator

The orientation comparator tool was designed to help in analyzing and comparing the best orientations for your part.

— See Orientation Comparator, page 215

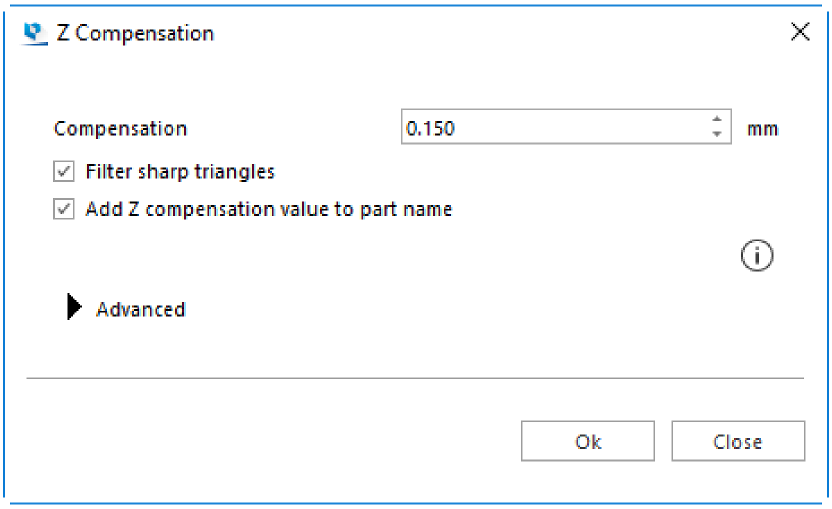
### 7.5.5 Shape Sorter

The shape sorter is designed to arrange parts with a similar geometry.

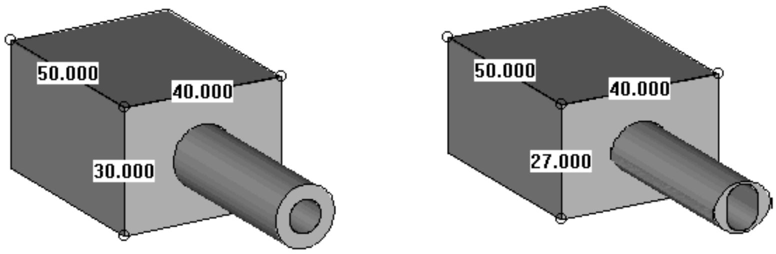
— See Shape sorter, page 220

### 7.5.6 Z-Compensation

For models built with Stereolithography and Laser Sintering, overcure may cause extra material to build up on down facing surfaces. To avoid the time consuming process of manually correcting these errors after the part is finished, the Z-compensation function can be used. To Z-compensate the selected parts, the user has to fill in a Z-compensation value in mm or inches and choose a Z-compensation algorithm in the following dialog:




The Z-compensation will classify all down facing surfaces that need compensation and offset them with the desired value. Appropriate modifications are made to adjacent triangles to keep the part consistent and error free.

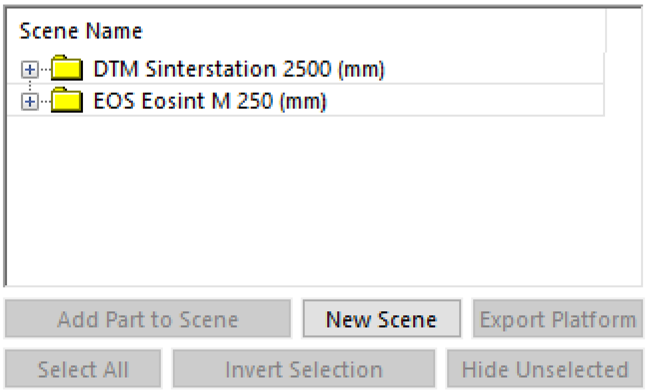



The figures above display the result of a Z-compensation:

- The first figure represents the original part
- The second figure represents the same part, but Z-compensated with a value of 3 mm
-

Remark: A Z-compensation value will in reality never be bigger than 0.5mm and this case 3mm is used for an educational purpose. If a part already has been Z-compensated, Magics gives a warning. This can be found in the Part Information page of the part toolpage (see

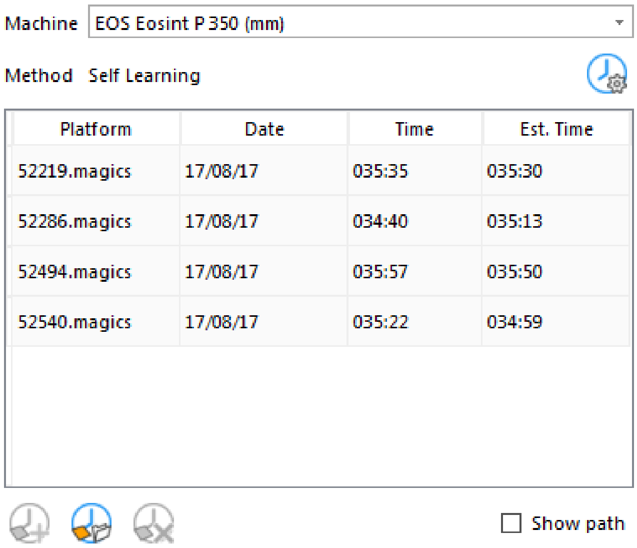
Scenes page



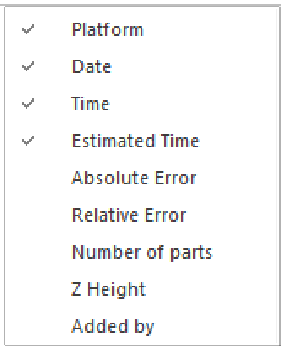

| | |
|---|---|
| Scene Name | All loaded scenes are displayed within a tree view. Below every scene you will find all parts loaded on that machine. |
| Add part to scene | This function is only available in the Platform Scenes. A dialog pops up, showing the parts loaded in the Modeler Scene. Check the parts, from which you want to create a virtual copy on the active Platform Scene. |
| New scene | The Select Machine dialog will pop up, where you can select the machine of the newly created Platform. |
| Export platform | Export all your parts/ copies to a chosen directory.<br>More information is found at the 'export platform' functionality. |
| Select All | Selects every part in the list. |
| Invert selection | All selected parts are unselected and the unselected parts are selected. The Invert Selected functionality works on the Selected (S) column. Invisible parts will thus become visible. |
| Hide unselected | Hides all unselected parts. |

### 7.5.7 Build Time Estimation page

The Build Time Estimation Toolpage keeps track of the settings for the build time estimation calculations; all machines stored in the My Machines library, including the Build Processor machines, are available in the toolpage.




| | | |
|---|---|---|
| Machine | This is a dropdown list containing all machines stored in the My Machines library. The machines are displayed following the priority assigned in the My Machines library. | |
| Method | The method chosen for build time estimation calculations is displayed. Click on the icon on the right side to edit the settings for the method chosen; the Machine Properties dialog will be automatically open. | |
| List of teaching platforms | The list is enabled only when the build time estimation method chosen is Self-learning. Here you can visualize and manage the data of your teaching platforms used for the build time estimation calculations. | |
| | Platform | The file name of the Magics project used as a teaching platform is displayed. |
| | Date | The value corresponds to the date when the teaching platform has been imported. |
| | Time | Insert the real build time of the teaching platform (hours and minutes). Double click on the field to edit the value. |
| | Estimated time | The value corresponds to the estimated build time of the teaching platform. |
| | Extend list with additional data | You have the possibility to add or remove additional columns; right mouse click on the list headers to display a list of additional columns. |

| | | |
|---|---|---|
| | |   |
| | Add current platform | Click on this icon to automatically add the current scene as a teaching platform. |
| | Import platform | Click on this icon to import a Magics project as a teaching platform. |
| | Delete platform | After selecting one or more teaching platforms from the list, click on this icon to delete the selected teaching platform(s) from the list. |
| | Show path | Select this option to display in the Platform column the file path instead of the Magics project file name. |

_Remark:_ Teaching platforms that miss teaching information are displayed in red in the teaching platforms list.

## 7.6 Part Pages

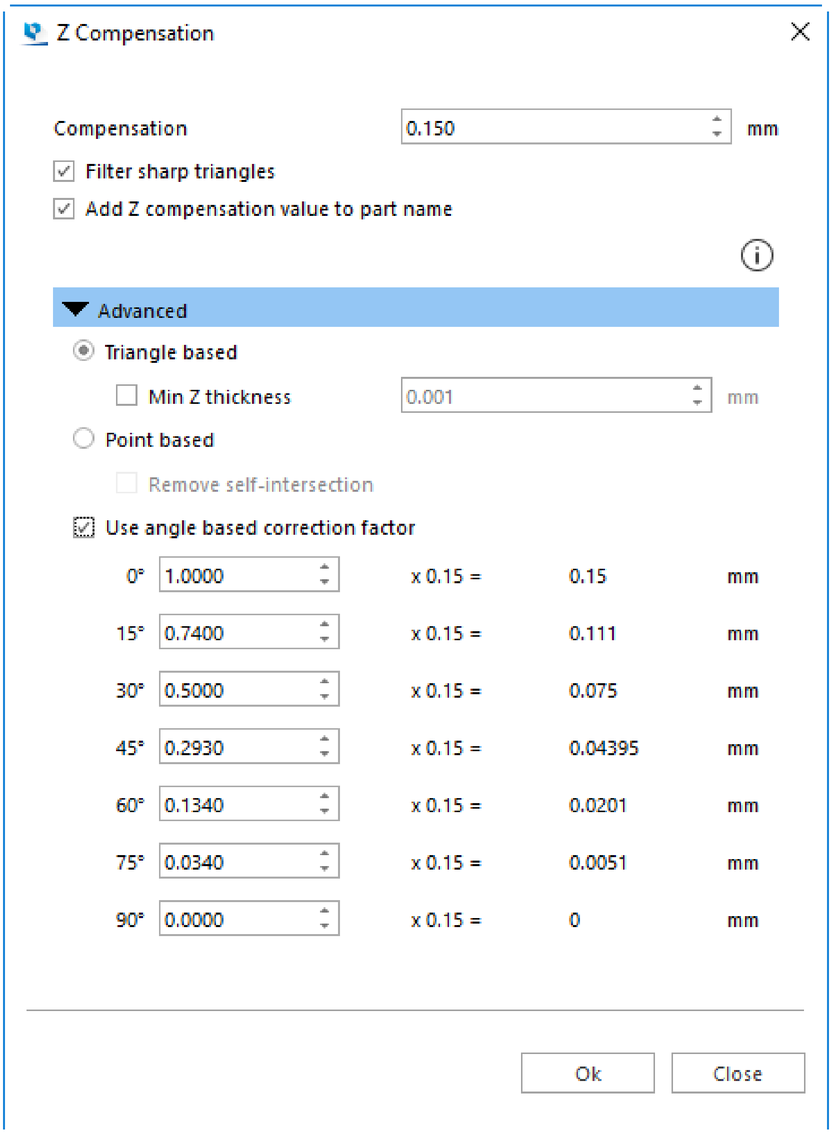
Part Info, page 410).

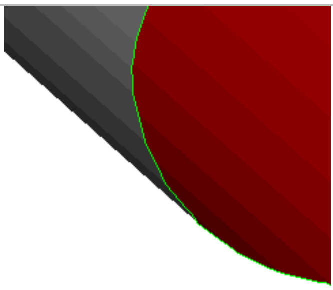
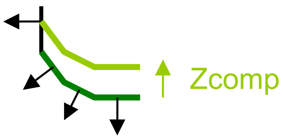
| | |
|---|---|
| Filter sharp triangles | Triangles thinner as this distance will be marked or removed, depending on your choice. |
| Add Z-compensation value to part name | This will add the value of the Z compensation to the Part Name. |

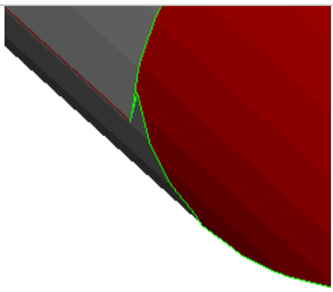
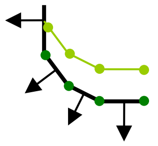
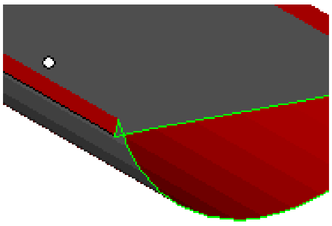
_Remark_: The parameters used for ‘Filter Sharp Triangles’ are linked to the ones in the fixing wizard.

### *7.6.1.1 Advanced Options*

In the Advanced Options, you can choose which algorithm Magics should use to perform the Z compensation. Also extra options to refine the Z compensation are available.

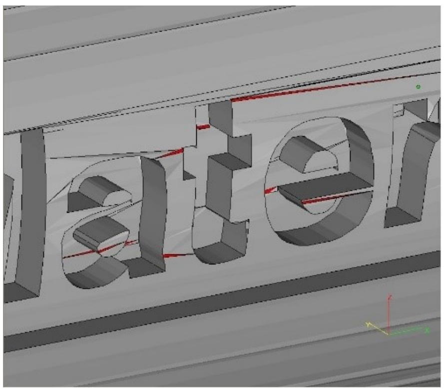



| | | |
|---|---|---|
| Triangle Based |  | This algorithm will detect all down facing triangles and will move them in the Z direction over a distance determined by the entered Z compensation value.   |
| | Min Z-thickness | Features thinner than – measured in the Z direction – this value will not be Z compensated. |

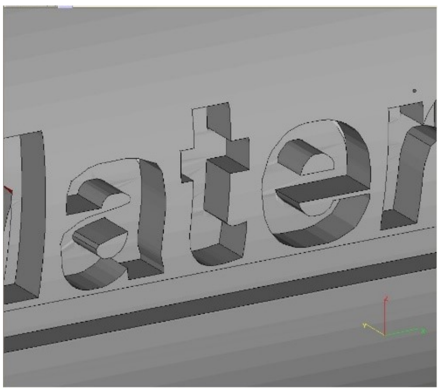
| | | |
|---|---|---|
| Point Based |  | This algorithm will detect all down facing triangles and will move the points of those triangles in the Z direction over a distance determined by the entered Z compensation value.<br><br> |
| | Remove Self-Intersections<br> | Remove Self-Intersections: By moving the down facing surfaces upwards, sometimes self-intersections may occur. When 'remove self-intersections' is switched on, a post processing will remove these intersections. This might take a while if the file is big. |
| Use Angle Based Correction Factor | Checking this function will apply a Z-compensation depending on the angle of the down facing triangle. If the angle is orientated horizontal, a full Z-compensation is performed. If the angle approaches an upright position, almost no Z-compensation is performed. This can be useful if you work with very accurate machines. | |

In most cases, the triangle based algorithm will give much nicer results. The figures below show an example.

*Point based Z compensation*



*Triangle based Z compensation*



## 7.7 Group


Sometimes people want to make sub-assemblies of parts.

With the grouping functionality parts can be placed in groups and these are handled as one part for a number of operations.

### 7.7.1 Ungroup

The Ungroup function can only be performed on a group of parts.

All part in the group becomes individual parts again.

The ungroup functionality is disabled when you select a part that doesn’t belong to a group.

### 7.7.2 Group

The group functionality groups selected parts in a group. The parts you can group can be either single parts or already defined groups. Nested groups don’t exist.

A group and a part that are grouped result in the part being added to the group.

A group and a group that are grouped result in a new group where the existing ones are combined.

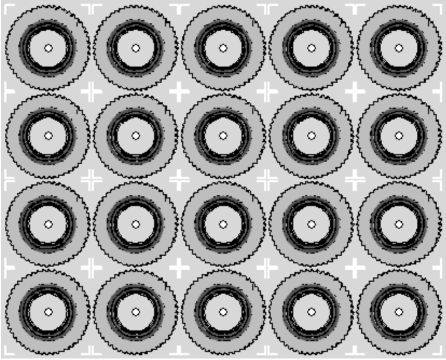
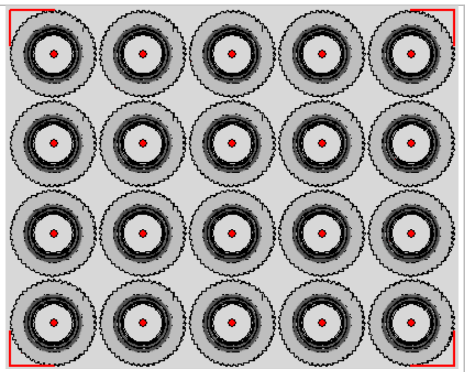
### 7.7.3 Remove From Group

The remove from group will remove selected part from the existing group.

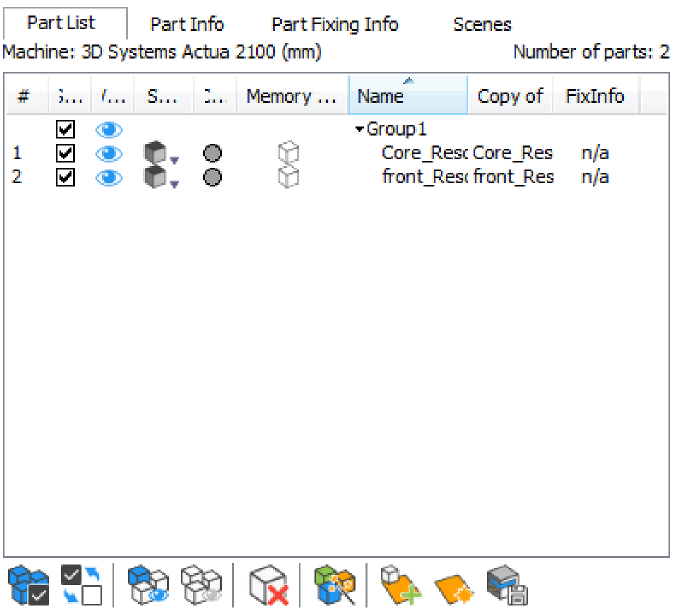
This option is only enabled when 1 or more parts of a group in the parts list are selected.

### 7.7.4 Grouping visualization

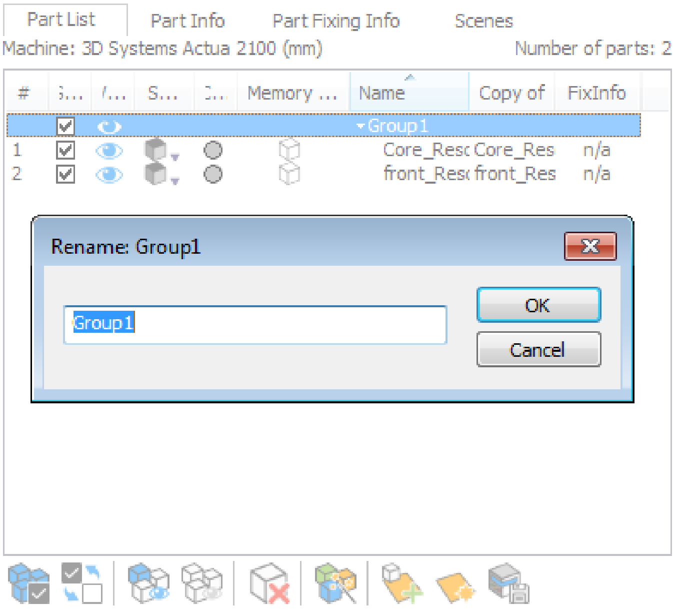
Parts that are part of a group can be recognized by the ‘red’ center point.

|  |  |
|---|---|
| *Not grouped* | *Grouped* |

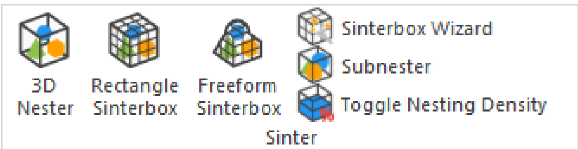
Within the part list the groups are displayed at the end of the list.
By default the naming of the groups start with “Group1”.




*Remark*: The name of the group can be changed by double clicking the name.




## 7.8 Sinter

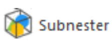



### 7.8.1 3D Nester


More information can be found in the 3D Nester module itself.

— See 3D Nester, page 479

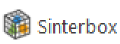
### 7.8.2 Subnester




More information can be found in the in the Sintermodule

— See Subnester, page 468

### 7.8.3 Sinterbox




Create a Sinterbox.

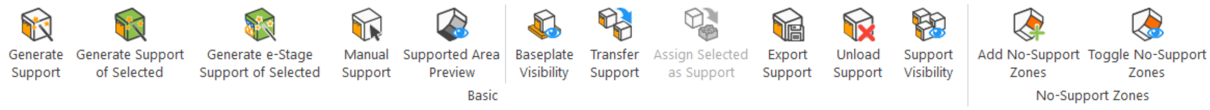
See Sinterboxes, page 472.

## 7.8.4 Toggle Nesting Density

Show /hide the nesting density of the current platform.

See Toggle Nesting Density, page 295

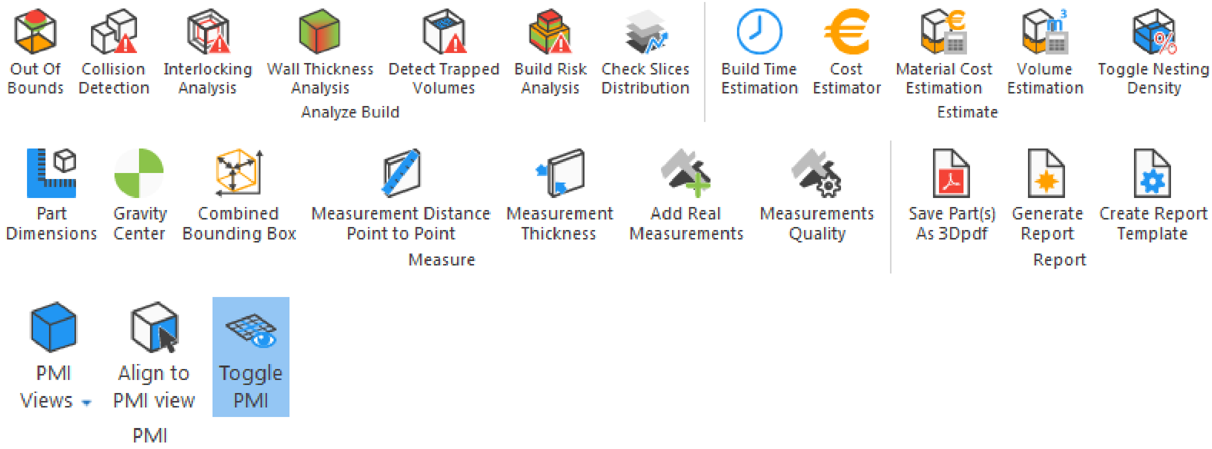
# 8 Chapter 8: Support Generation




More information can be found in the Support Generation module itself.

— See Chapter 3: Support Generation, page 506

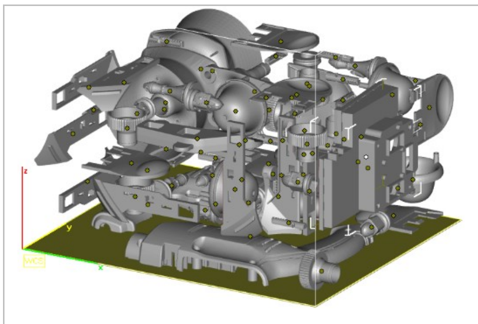
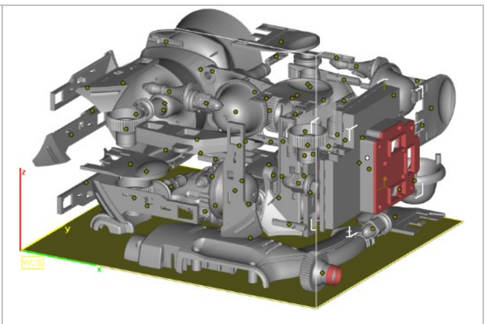
# 9 Chapter 9: Analyze & Report




## 9.1 Analyze Build


### 9.1.1 Out of bounds

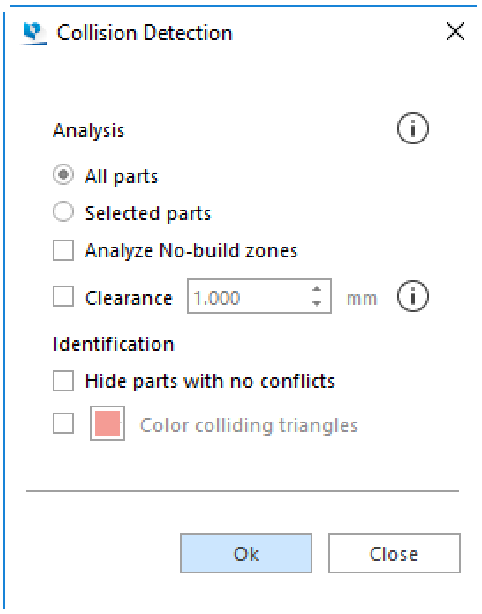
The out of bounds function will color parts which are placed outside of the platform bounds. Any placement tool can be used without losing the color indications.

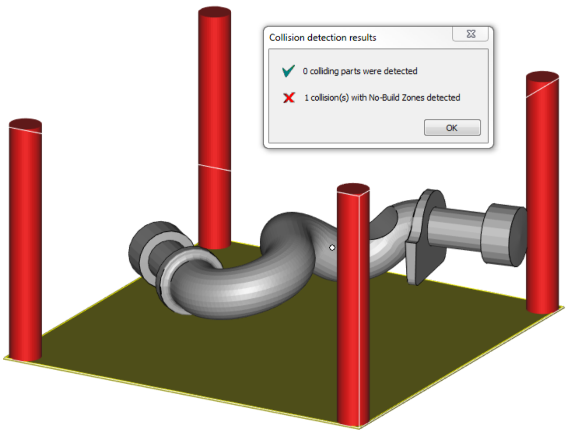
| | |
|---|---|
|  |  |
| Out of bound: OFF | Out of bound: ON |

*Remark*: On round platforms, the whole part is colored when it (or its support) is out of bounds.

### 9.1.2 Collision Detection

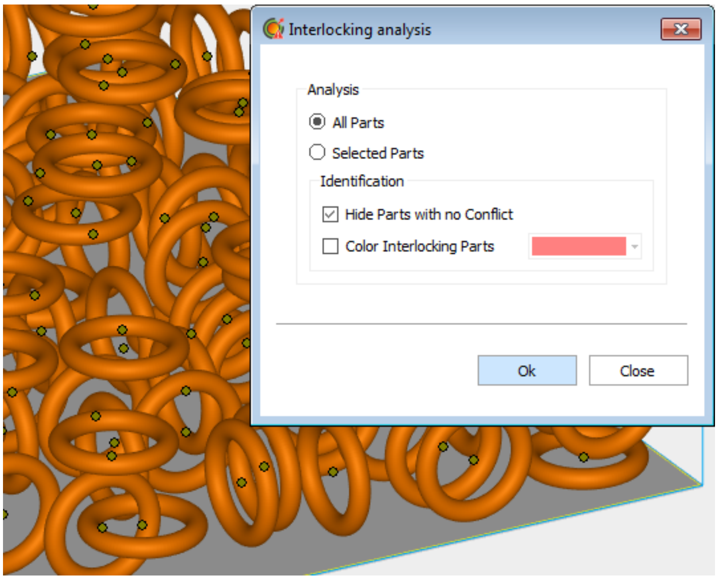

If several parts are loaded on the platform, Magics can detect if there is a collision. Collision can be detected between intersecting triangles or with an indicated clearance between different parts and supports. A message-box appears to tell you if there are or aren't colliding parts and/or supports. The involved triangles are marked (parts only, supports can't be marked).




| Analysis | |
|---|---|
| All parts | Collision is detected between all loaded parts on the platform scene. |
| Selected parts | Collision is only detected between selected parts |
| Analyze No-Build-Zones | Collision is detected between the part(s) and active 'No-Build-Zones'  |
| Clearance | Define the spacing allowed between parts. If they are located within a distance smaller than this value, they will be identified as colliding parts. |

| | |
|---|---|
| Identification | |
| Hide parts with no conflict | Make parts where no collision is detected invisible after the analysis |
| Color colliding triangles | Color triangles where collision is detected |

### 9.1.3 Interlocking Analysis

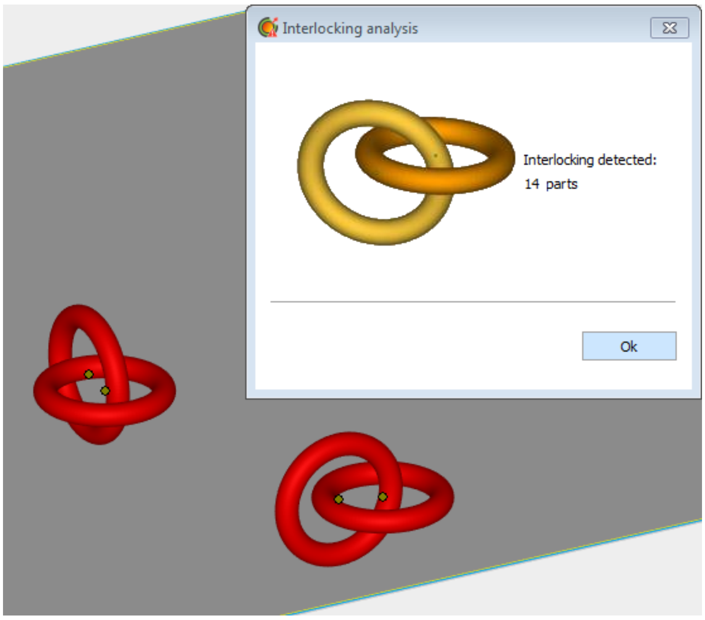




Interlocking means that 2 (or more) parts cannot be separated due to the positions they are nested in. When performing an Interlocking Analysis, the user can choose to analyze all parts or only the selected parts. One can choose how to identify the interlocked parts by checking or unchecking the boxes under Identification:

- ‘Hide Parts with no Conflict’ hides all parts that are not interlocked with one another.
- ‘Color Interlocking Parts’ will color the detected interlocked parts to the specified color.

If interlocking is detected, all suspected interlocking parts are visualized, while the other parts are hidden (if the user chose this option).

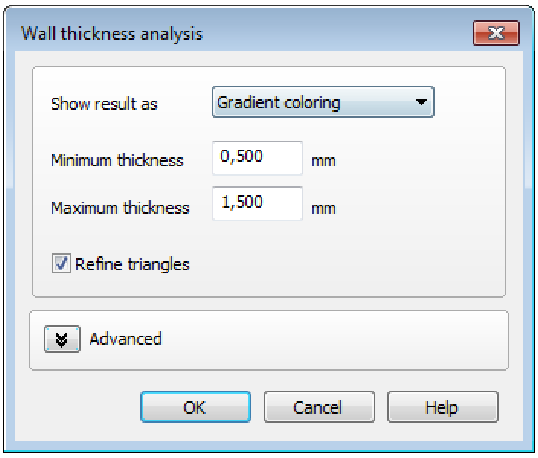



## 9.1.4 Wall Thickness Analysis


The wall thickness analysis helps you to detect small details, thin and/or thick walls. This can be very helpful, because you can predict where problems can pop up during building.

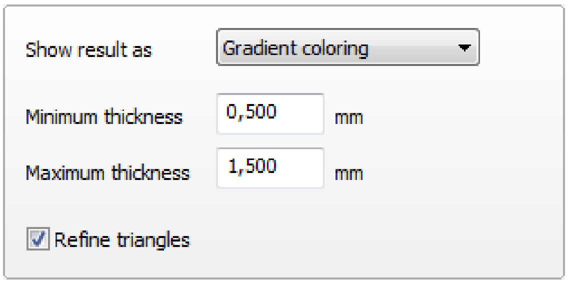
### *9.1.4.1 Principle*

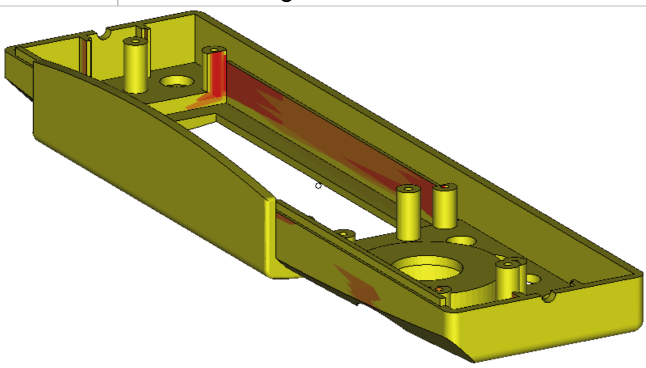
Magics determine for each triangle separately the local wall thickness. If requested, Magics divides bigger triangles in smaller ones according to the refine triangles parameters entered. This way, a more detailed figure of the wall thickness can be calculated.

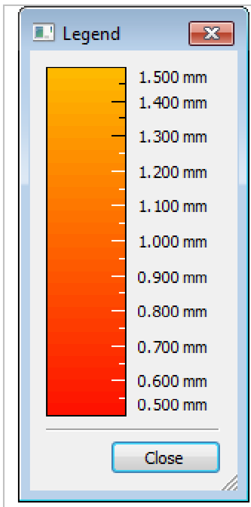


### 9.1.4.2 *Gradient coloring*

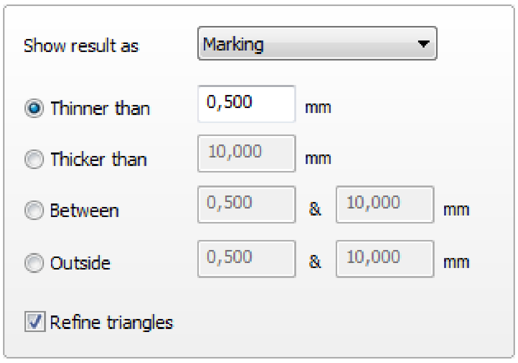
The triangles are colored corresponding their wall thickness. In the Legend you can see which wall thickness corresponds to which color.




| | |
|---|---|
| Minimum thickness | This parameter defines the minimum wall thickness needed. Every triangle with a local wall thickness smaller than the entered value, will receive the begin color. |
| Maximum thickness | The maximum thickness is the wall thickness for which you no longer expect to have problems. Local thickness bigger than the maximum thickness do not need special attention and will have the end color.<br><br>Triangles with local thickness situated between the minimum and the maximum thickness will have a color gradually changing from the begin color (minimum) to the end color (maximum wall thickness) over the color spectrum. The minimum and maximum wall thickness also forms the borders of the Wall Thickness Color Legend. |
| Refine triangles | If checked, the triangles that met the criteria are retriangulated. The analysis is based on the newly created triangles. |
|  | |

| | |
|---|---|
|   | Triangles that met the criteria can be colored after the analysis.<br><br>In the legend you can see which wall thicknesses correspond to which color.<br><br>Color range can be customized from the customization settings. |

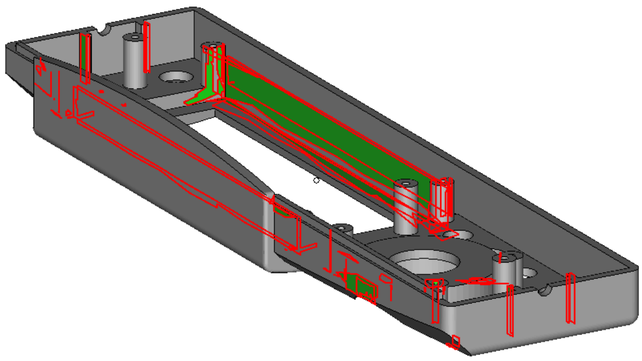
### 9.1.4.3 *Marking*

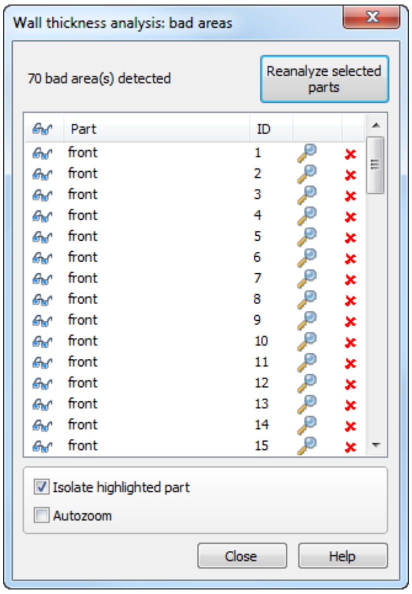



| | |
|---|---|
| Detect triangles of walls | Choose one of the detectors (Thinner than, Thicker than, Between or Outside) and enter the limiting value in the edit box. |
| Thinner than | Search walls thinner than the entered value |
| Thicker than | Search walls thicker than the entered value |
| Between | Search walls between the entered values |
| Outside | Search walls outside the entered values |
| Refine triangles | If checked, the triangles that met the criteria are retriangulated. The analysis is based on the newly created triangles. |

After the analysis of the part(s) a list is shown with areas that match the WTA conditions.

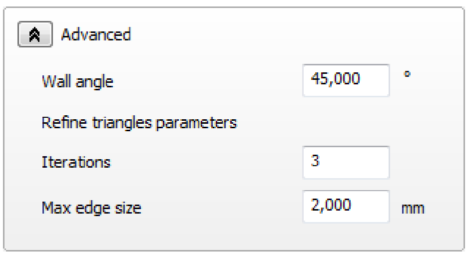
Every group of triangles is indicated as a bad area. The list gives a clear overview of all problem areas on the part(s). By clicking on the magnifying glass, the view will zoom to that specific bad area.






| | |
|---|---|
| Visible/ Invisible | Hide/ unhide bad areas |
| Part | Part name is displayed |
| ID | Every bad area is indicated with a unique ID to easily identify regions |
| Zoom | Zoom to indicated area |
| Delete | Remove the indicated area from the list |
| Reanalyze selected parts | The list is updated by performing a new wall thickness analysis |
| Isolate highlighted parts | Only the selected part in the part list is isolated. To have a good overview all other parts on the platform are invisible. |
| Autozoom | Zooms automatically to the bad area that is highlighted |

### 9.1.4.4 *Advanced*



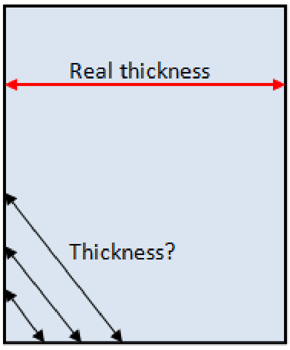

| | |
|---|---|
| Wall angle | Defining a wall angle makes it possible to exclude certain areas/ surfaces from the analysis. |

| | |
|---|---|
| | (More information below) |
| Refine triangles parameters (More information below) | |
| Iterations | The value entered as the number of iterations places an upper limit on the number of iterations. |
| Max edge size | A triangle will only be split up in a smaller triangle if one dimension of that triangle is bigger than the maximum edge size. This parameter thus decides the accuracy with which you are going to visualize (and measure) the thickness distribution. |

### 9.1.4.4.1 Wall angle

During the analysis of the part, certain areas of the part can be excluded from the calculations.

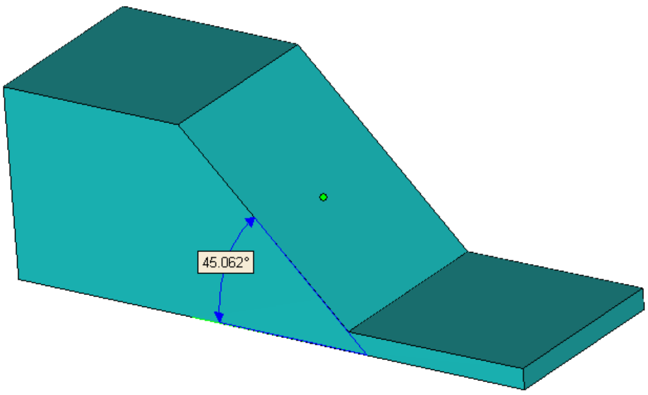
The following 2D drawing illustrates the case where you have a wall with two rectangular angles.




From a triangle point-of-view the local wall thickness approaches zero when coming closer to the edge of the part. The real thickness though remains the same throughout the whole wall. Therefore we can exclude the area around these edges from the thickness calculations.

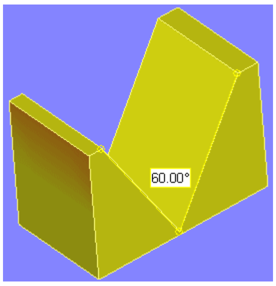
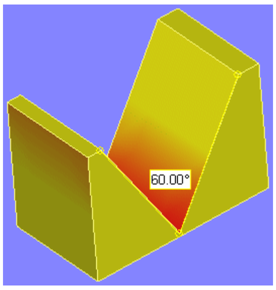
The wall angle is the parameter that avoids that the above areas are taken into account. When the wall angle is for instance set to 60 degrees, thickness calculations will only be done for edges whose angle is smaller than 60 degrees. These edges will be interpreted as functional edges of the part and not just 'wall borders'.

On the figure below you can see a sample of a file where the triangles have an angle of 45 degrees between each other.



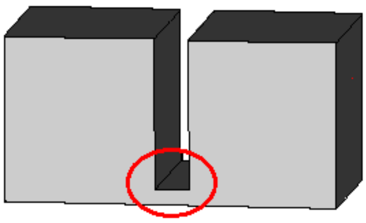
Set Wall Angle value less than the angel between triangles (in this case it is less than 45 deg.), these triangles won't be detected by WTA tool.

Set Wall Angle value higher than the angle between triangles (in this case higher than 45 deg.), these triangles will be detected by WTA tool.

| Wall Angle = 50° | Wall angle = 70° |
|---|---|
| Critical gap angle = 180-(2*50)= 80° | Critical gap angle = 180-(2*70)= 40° |
|  |  |
| 60° < 80°: the local thickness reduction is not taken into account | 60°>40°: the local thickness reduction is taken into account |

9.1.4.4.2 Refine triangles parameters

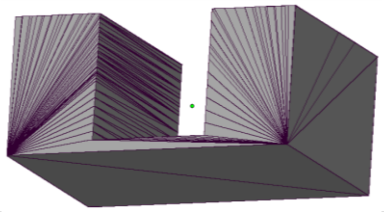
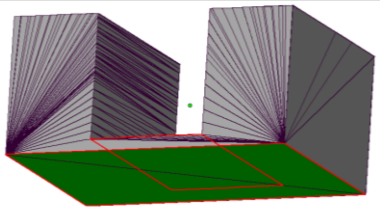
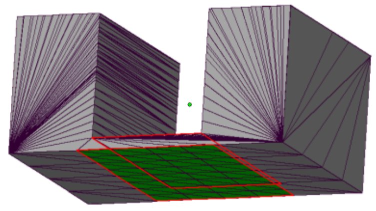
Now let us take a look at the following part.



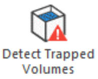
At the bottom of the rectangular gap, there is a significant thickness reduction. Therefore we expect that on the bottom plane, close to the gap, a region will show up to indicate this smaller thickness.

However, there is a small problem ... the bottom plane will probably exist out of two big triangles. During the analysis the complete plane will become indicated. 'Refining the triangles of the bottom plane solves this problem. The two big triangles are spitted up in smaller triangles, and the thickness variation can now be visualized more accurately.

Three parameters define this remeshing process.

|  |  |  |
|---|---|---|
| Original part | Analysis performed on original part | Analysis and refine triangles performed on original part |

### 9.1.5 Detect Trapped Volumes




This functionality can be used to easily detect trapped volumes (cavities) in your part(s).

Before building parts with SL technology many users will try to identify if their parts consist out of any cavities. During building there will be a height difference between the resin within the cavity and the bin itself. This difference can lead to deformation of surfaces.

To pass this problem you can utilize the ‘Detect Trapped Volumes’ functionality to identify the trapped volumes on your part easily, once these areas are detected some perforation can be made to avoid deformation or parts can be repositioned to minimize the trapped volumes.

Another way to overcome this problem without creating perforations is to use the ‘Detect Trapped Volumes’ function to indicate the Z min and Z max values of the trapped volumes. These values can then be used within the machine software to adapt the build process.

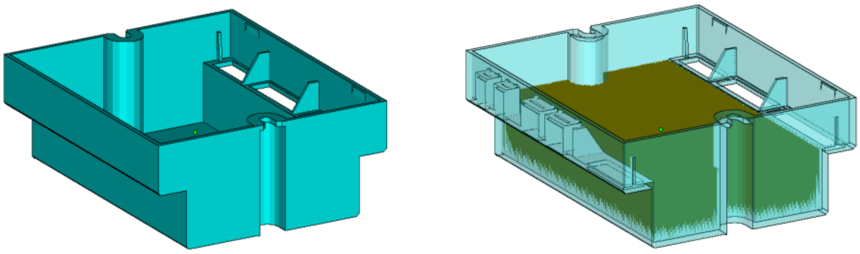
(Change the number of times that the recoater passes for each layer. More resin will be put in the trapped volume areas so that the resin level is the same at the inside and outside of the trapped volume.)

#### *9.1.5.1 Type of trapped volumes*

There are 2 types of trapped volumes that can be detected on your part, which are open volumes and closed volumes.

- Open trapped volumes:
-

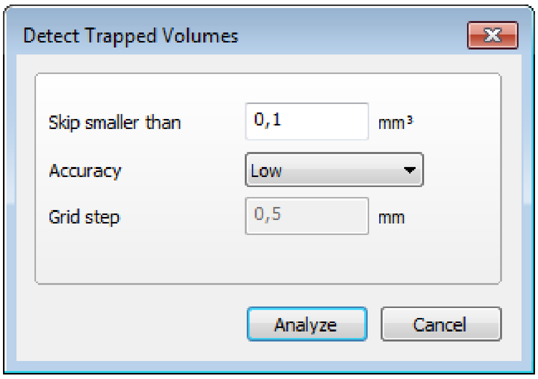
These are cavities in your part which have a connection to the outside world. During the building process there might occur an issue due to a difference in height of the resin on the in- and outside of the part.



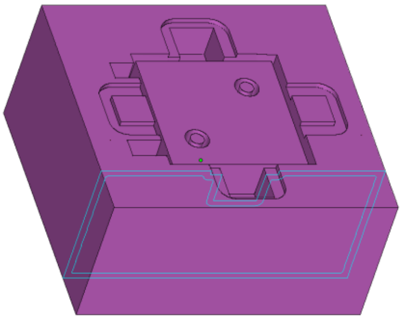
— Closed volumes:
—

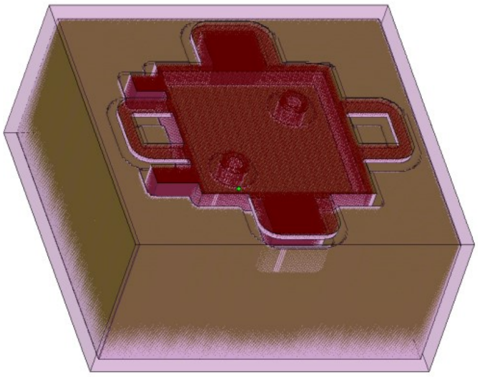
Internal cavities with a volume bigger than the specified value.

### *9.1.5.2 How does it work?*



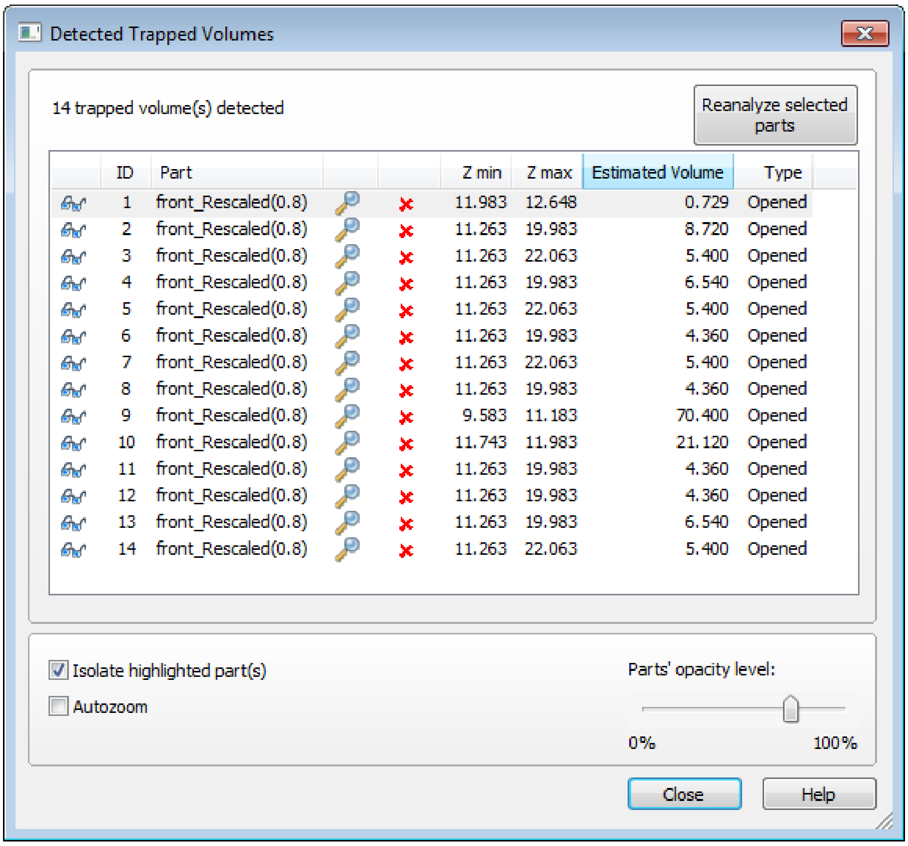
| | | |
|---|---|---|
| Skip smaller than | Eliminate cavities which are smaller than the entered value in mm³ | |
| Algorithm | Accurate | High accuracy, slow analysis |
| | Medium | Medium accuracy, medium speed |
| | Fast | Low accuracy, high speed |
| | User | User defined accuracy |
| Grid step | Depending on the chosen algorithm a predefined or user indicates step is used | |
| Analyze | The analysis of the trapped volumes is performed | |





2 trapped volumes detected = 1 open volume + 1 closed volume (hollow)

Further specifications of the found trapped volumes are shown in the print screen below

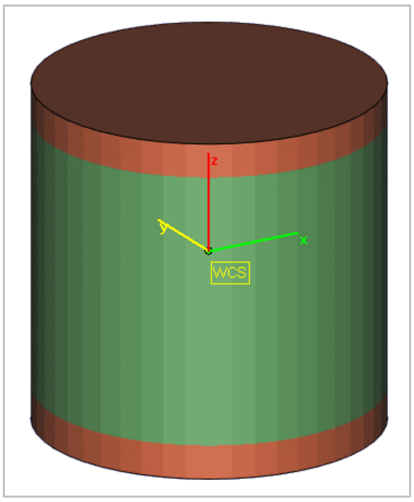



| | |
|---|---|
| Visible/ Invisible | Hid/ unhide trapped volumes |
| ID | Every trapped volume is indicated with a unique ID to easily identify them |
| Part | Part name is displayed |
| Zoom | Zoom in to the indicated trapped volume |
| Delete | Remove the indicated trapped volume from the list |
| Z min | The starting height of the trapped volume |
| Z max | The ending height of the trapped volume |
| Volume | The total volume of the cavity |
| Type | The type of trapped volume |
| Reanalyze selected parts | The list is updated by performing a new analysis on trapped volumes |
| Isolate highlighted part | Only the selected part in the list is isolated. To have a good overview all other parts on the platform are visible |
| Autozoom | Zoom automatically to the trapped volume that is highlighted |
| Part opacity level | Use the slide bar to change the opacity level of your part |

### 9.1.6 Build Risk Analysis

Visualize the risk of failure or distortion on the selected part(s) according to the slice distribution.

The risk is visualized by red, yellow or green. Areas with a high risk are shown in red, areas with medium risk in yellow, and areas with no risk are shown in green.



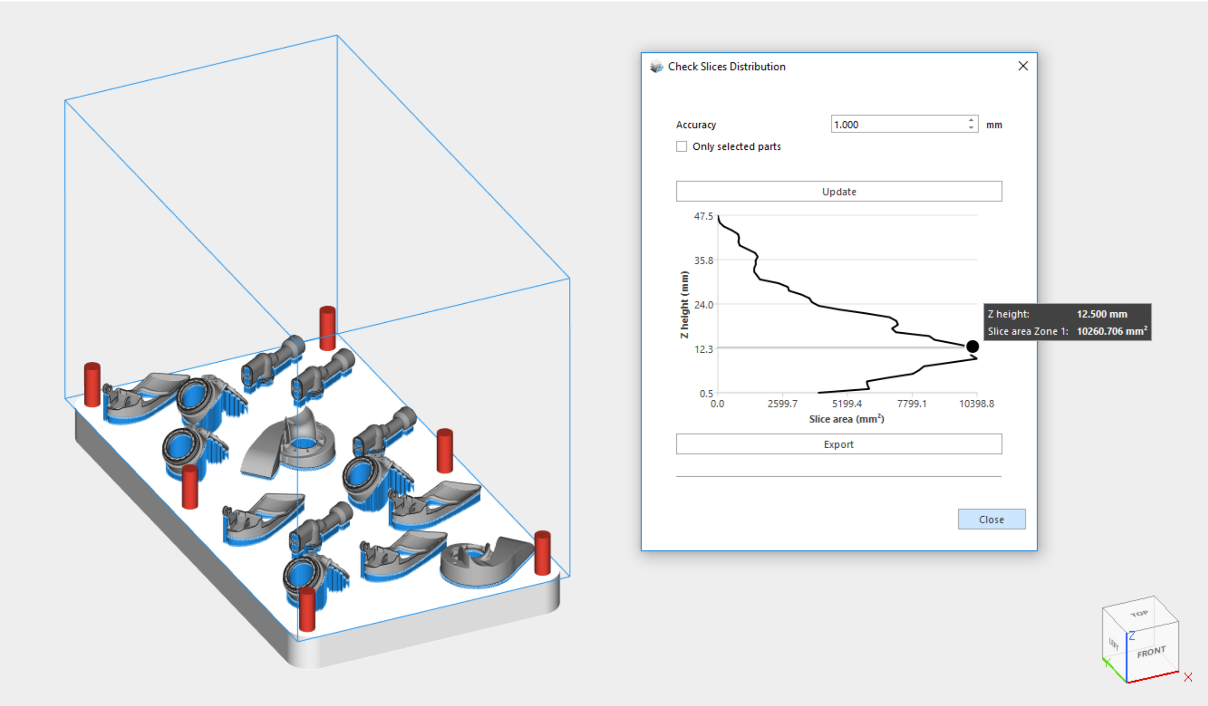

— For the settings, see Build risk analysis, page 363

### 9.1.7 Check Slices Distribution

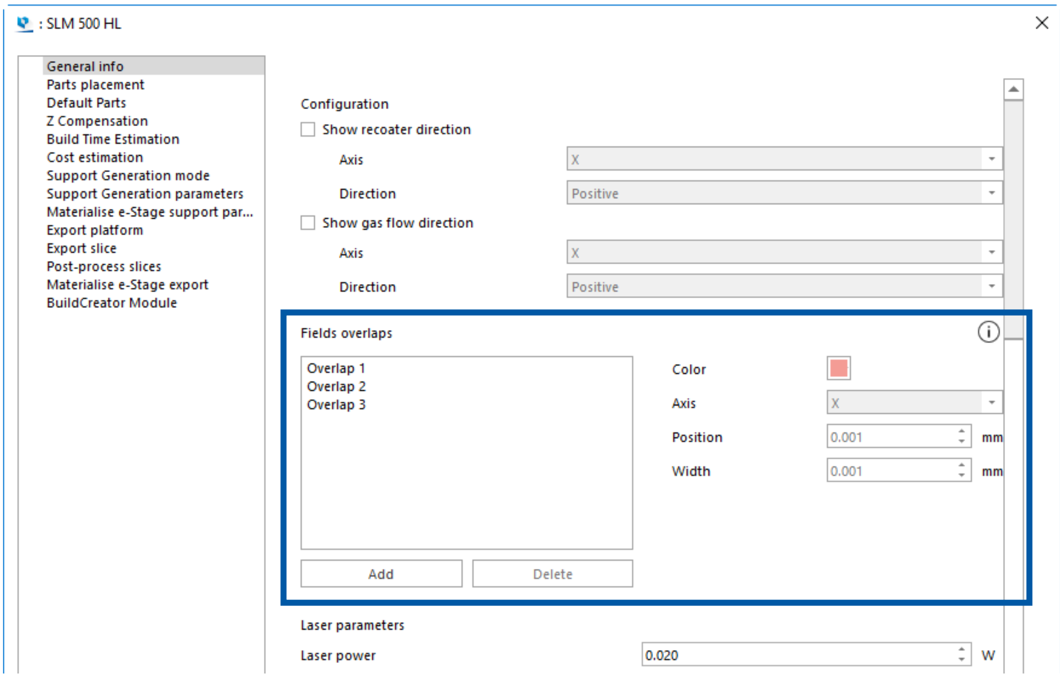
The slice distribution chart gives you the possibility to analyze the surface area for each layer and the distribution within your build. Hover over the chart with the mouse and visualize the values of Z height and slice area for each point.

By adjusting the accuracy, you can control the distance between layers, which will be taken into account during the calculation; the bigger the accuracy, the further the layers will be between each other.

You are able to view the chart for the entire build or for the selected parts only. Supports structures are also taken into account in the slice area.




When fields are defined in the Machine Properties (see General info page, page 242), you can use those to split the chart data in multiple zones. This makes it possible to analyze the workload of multi-optic machines. Every zone of the chart represents the slice area of one scan field. You can decide to visualize or not the total slice area together with all the zones. The color on the chart corresponds to the color on the platform.



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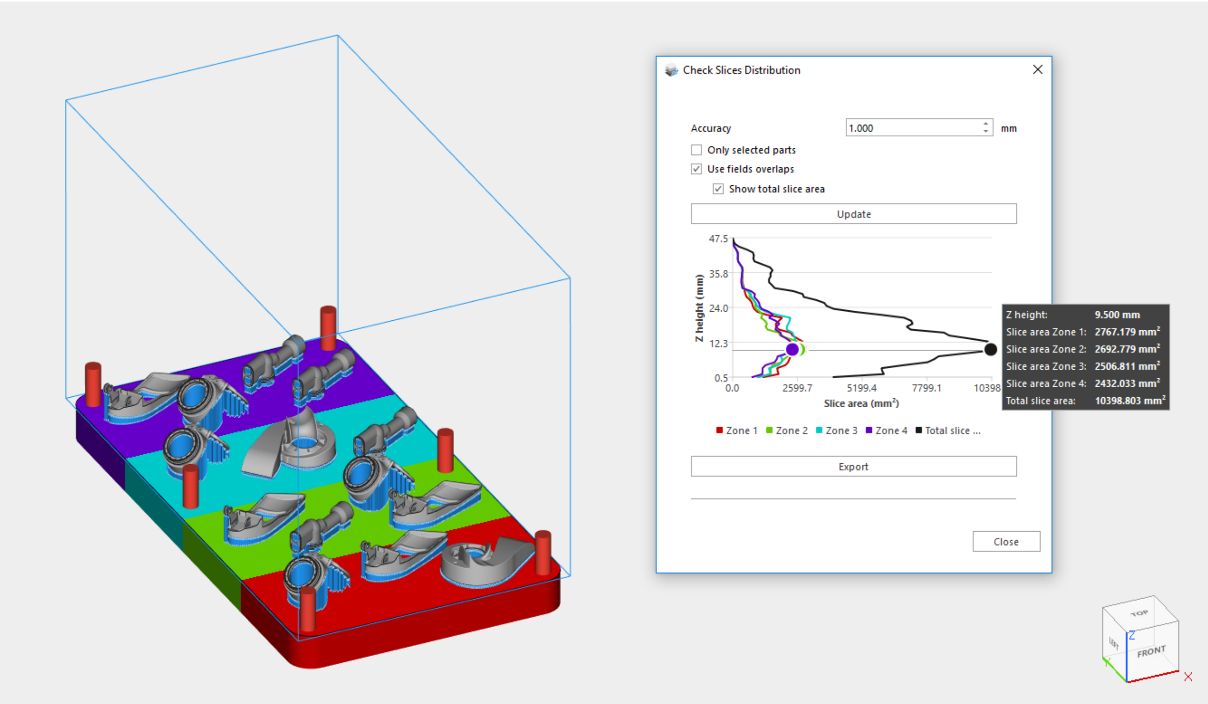



The data from the graph can also be exported to an Excel document.

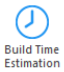
| Height (mm) | Total slice surface (mm²) | Zone 1 (mm²) | Zone 2 (mm²) | Zone 3 (mm²) | Zone 4 (mm²) |
|---|---|---|---|---|---|
| 0,500 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| 1,500 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| 2,500 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| 3,500 | 0,000 | 0,000 | 0,000 | 0,000 | 0,000 |
| 4,500 | 1396,981 | 463,590 | 198,186 | 500,305 | 234,900 |
| 5,500 | 2669,143 | 637,865 | 685,160 | 649,411 | 696,706 |
| 6,500 | 3329,102 | 767,590 | 969,131 | 695,420 | 896,960 |
| 7,500 | 4068,768 | 973,128 | 1359,996 | 674,389 | 1061,255 |
| 8,500 | 5657,322 | 1219,249 | 1864,442 | 964,220 | 1609,412 |
| 9,500 | 7172,291 | 1689,107 | 2138,811 | 1447,336 | 1897,036 |
| 10,500 | 7084,237 | 1815,470 | 2003,419 | 1538,699 | 1726,649 |
| 11,500 | 7285,301 | 1913,116 | 2095,957 | 1546,693 | 1729,533 |
| 12,500 | 7568,379 | 1962,788 | 2236,434 | 1547,754 | 1821,403 |

For more information on the usage of the Slices Distribution together with the Sintermodule:

— See Check slices distribution, page 501

## 9.2 Estimate


### 9.2.1 Build Time Estimation

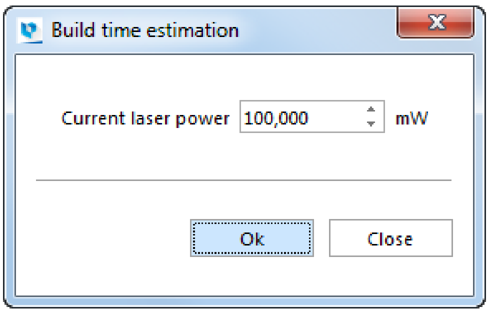



There are two ways to calculate build time:

- Stereolithography based: If the user is building with a Stereolithography machine, he can use the Stereolithography parameters of his machine. The program will take an artificial support structure into account (a grid below the part).
- Self-learning: In all other cases, self-learning build-time calculation is possible. The user can work with or without generated support structures.
-

In both cases, choosing the Build Time Estimation calculation function will display the results in the working area, for an easy overview on the estimation. This data is automatically updated in case transformations are applied to the parts present in the scene. To hide the results from the working area, you can just click again the Build Time Estimation button.

In the Machine Properties, under the Laser parameters options, you can specify a default value for the Laser power of the specific machine. Moreover, you can select if you want the software to ask you for the laser power each time the Build Time Estimation function is started. In case this option is selected, the dialog below will be shown when you start the Build Time Estimation function.




_Remark_: this dialog is available for:

- Laser parameters method (Stereolithography based machines)
- Self-learning method in combination with selection of Laser-based system option. This option can be specified in the Machine Properties, under the Self-learning settings.

### *9.2.1.1 Build Time calculation with Laser parameters*

In case of SL-based build-time calculation you will get the following result:

| | Build time estimation |
|---|---|
| Part scan time | 143 hrs 41 min |
| Support scan time | 11 hrs 27 min |
| Recoat time | 06 hrs 44 min |
| Total time | 161 hrs 53 min |
| Machine laser power | 20.0000 mW |

Five values are displayed: the scan time of the part, the scan time of all the supports, the total recoating time, the total building time and the machine laser power selected.

### *9.2.1.2 Self-learning Build Time Calculation*

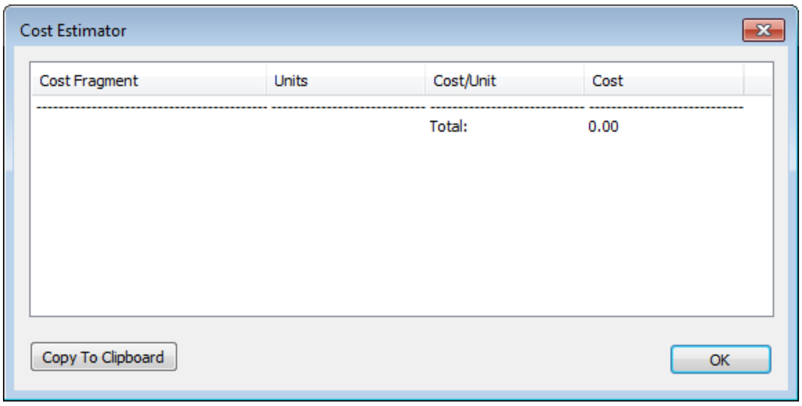
In case of self-learning Build Time calculation the following result will be displayed:

| | Build time estimation |
|---|---|
| Total time | 07 hrs 30 min |

This build time is calculated for the current platform (all loaded parts) and is based on the teaching platforms which where specified in the Machine Properties.

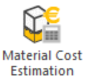
## 9.2.2 Cost Estimator


The Cost Estimation is based upon parameters, which are machine dependent. Therefore, these parameters are defined in the Machine Settings. When you enter this function, the Select Machine dialog will appear, where you can choose a machine. The cost estimator calculates the cost of making the parts. For further details on the parameters used in the Cost Estimator, see Support Generation Manual.

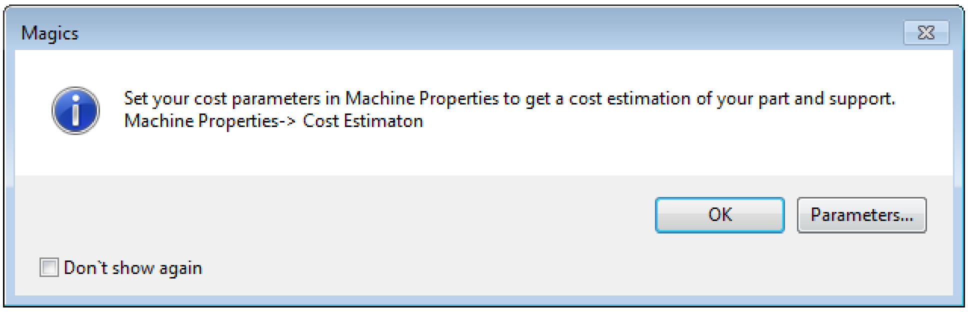



*Remark*: When you use Copy To Clipboard you can enter these data in Excel, Word, etc.

### 9.2.3 Material cost estimation



Show an estimation of the material cost of the selected part(s). To calculate the estimation, the cost parameters in Machine Properties need to be filled in. The following dialog will pop up:



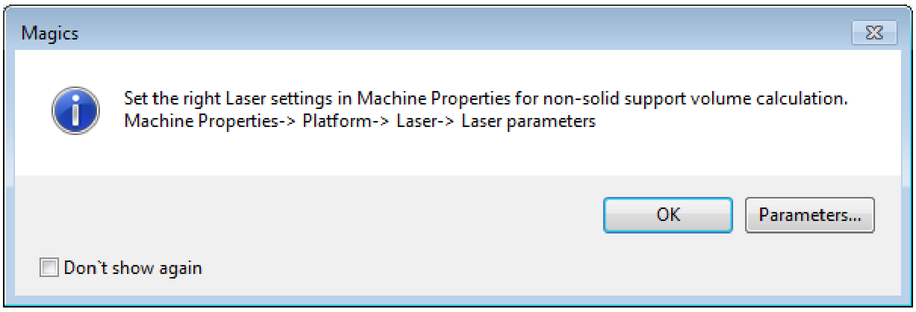

Click ***Parameters*** to directly go to the Parameters in Machine Poperties.

- See Stereolithography method
- , page 250

Click ***OK*** to close the dialog. The estimation is made based on the available parameters and is shown:

### 9.2.4 Volume estimation

Show an estimation of the materials volume of the selected part(s). When toggled the icon gets a blue background. To calculate the estimation, the laser spot diameter parameter in Machine Properties need to be filled in. The following dialog will pop up:




Click ***Parameters*** to directly go to the Parameters in Machine Poperties.

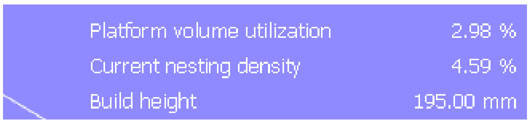
- See Stereolithography method
- , page 250

Click ***OK*** to close the dialog. The estimation is made based on the available parameters and in shown:

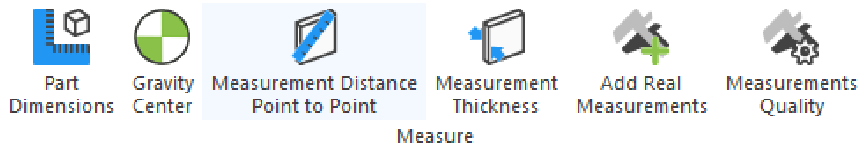
| | Volume |
|---|---|
| Part(s) | 69910.852 mm³ |
| Support | 0.000 mm³ |
| Base Plate | 0.000 mm³ |
| Total | 69910.852 mm³ |

### 9.2.5 Toggle Nesting Density

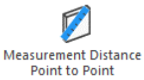
Show/hide the nesting density of the current platform. Activating the nesting density gives an easy overview in the working area of the current volume utilization of the platform, the current nesting density and the build height of the nested build. When toggled the icon gets a blue background. This functionality is ONLY accessible when Sintermodule license is present.




## 9.3 Measure




### 9.3.1 Measurement distance point to point

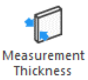



Measure a distance point to point (CTRL+SHIFT+X).

Extra information on the measurement is shown in the Measurements pages.

— See Measurements, page 434

### 9.3.2 Measurement thickness




Measure the thickness of an area. (CTRL+SHIFT+Q)

Extra information on the measurement is shown in the Measurements pages.

— See Measurements, page 434

### 9.3.3 Add Real Measurements


— See Add real measurement, page 440

### 9.3.4 Measurements Quality

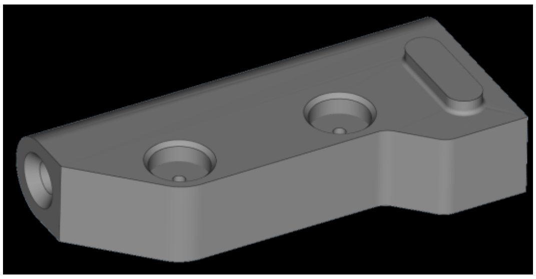

Measurements Quality brings you directly to the Measurements Quality dialog in the Settings.

- See Measurements Quality, page 318

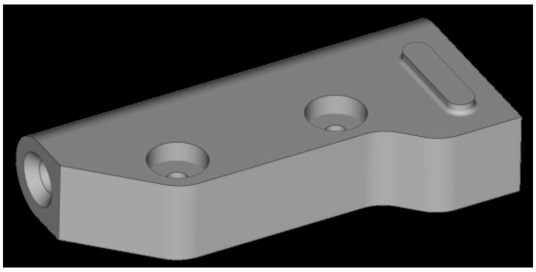
### 9.3.5 Part Comparison


The Part Comparison tool allows you to compare two meshes based on their triangle vertexes. The results are visualized in a color gradient map on the reference part, helping you to find the differences between the two selected parts.

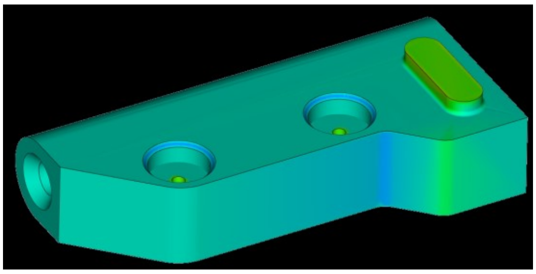
*Reference part*



*Comparison part*



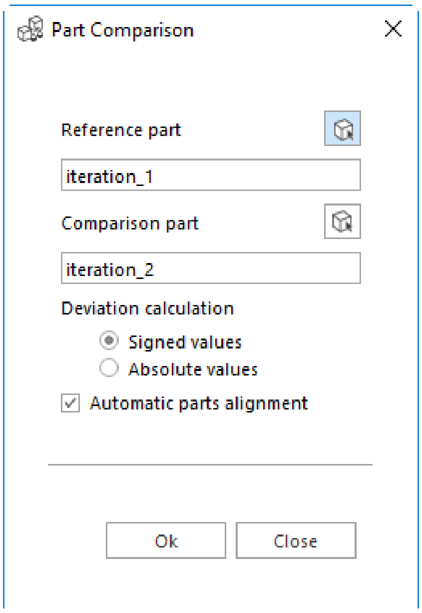
*Color map on reference part*



This tool can be used in various flows:

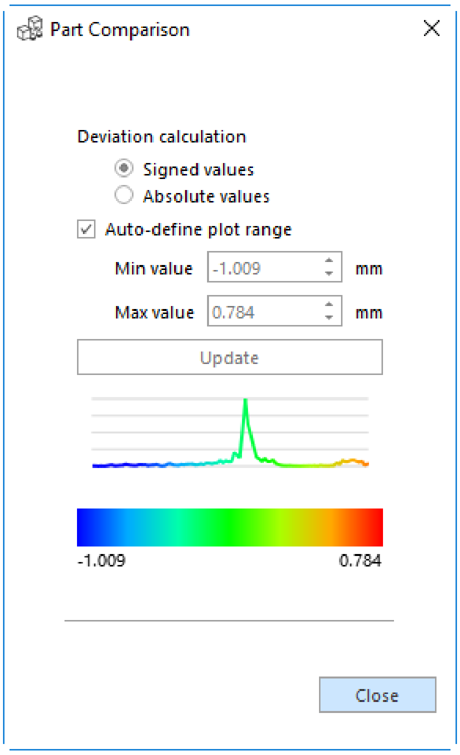
- Compare parts from different design iterations, to spot where the small differences are
- Analyze the shape deviation before-and-after repairing or editing the part mesh, to check if your part still lies in the tolerances you set
- Analyze the part deformation derived from the printing process or to compare the generated counter-deformed part that will compensate those distortions (in combination with Magics Simulation)

### 9.3.5.1 Settings



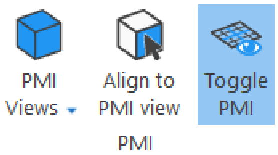

<table>
<tr><td>Reference part</td><td colspan="2">Select the part that will be used as a reference during the comparison. The gradient color map of the results will be visualized on this part.</td></tr>
<tr><td>Comparison part</td><td colspan="2">Select the part that will be used as a comparison part.</td></tr>
<tr><td rowspan="3">Deviation calculation</td><td colspan="2">Select the analysis type used during the comparison. The type can also be changed on the spot later when visualizing the results.</td></tr>
<tr><td>Signed values</td><td>Negative and positive deviations are used to differentiate between areas where reference part is inside the comparison part (negative) and where reference part is outside the comparison part (positive).</td></tr>
<tr><td>Absolute values</td><td>No difference is made on values sign, only absolute values of deviation between both parts are calculated.</td></tr>
<tr><td>Automatic parts alignment</td><td colspan="2">Enable this option when the 2 parts to be compared are not aligned with each other. An automatic alignment between the 2 parts will be performed before calculating the results.</td></tr>
</table>

### 9.3.5.2 *Results visualization*




| | | |
|---|---|---|
| Deviation calculation | Select the analysis type used during the comparison. The type can also be changed on the spot later when visualizing the results. | |
| | Signed values | Negative and positive deviations are used to differentiate between areas where reference part is inside the comparison part (negative) and where reference part is outside the comparison part (positive). |
| | Absolute values | No difference is made on values sign, only absolute values of deviation between both parts are calculated. |
| Auto-define plot range | Enable this option to automatically visualize results on the part accordingly to the minimum and maximum deviation values present in the comparison. | |
| | Min. value | Manually define the minimum value of the color map. Deviations outside the range will be colored in grey. |
| | Max. value | Manually define the maximum value of the color map. Deviations outside the range will be colored in grey. |
| Update | Click on this button to update the chart based on top defined settings. | |

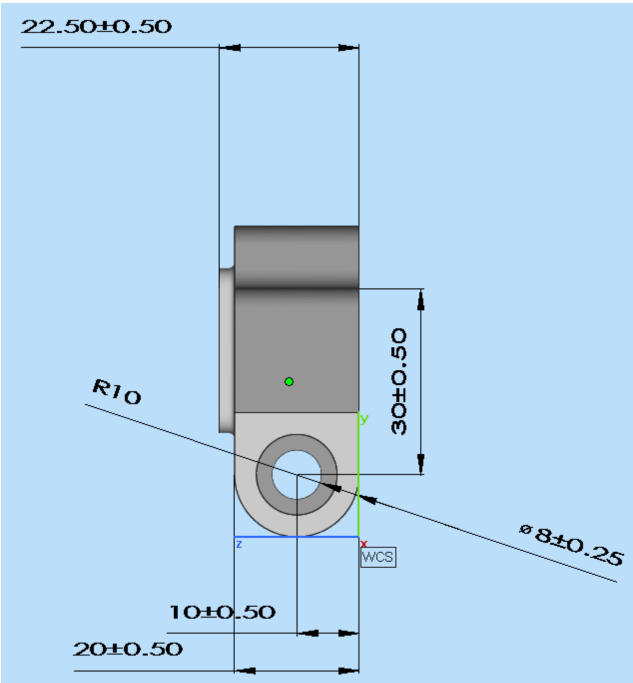
## 9.4 Product and Manufacturing Information (PMI)



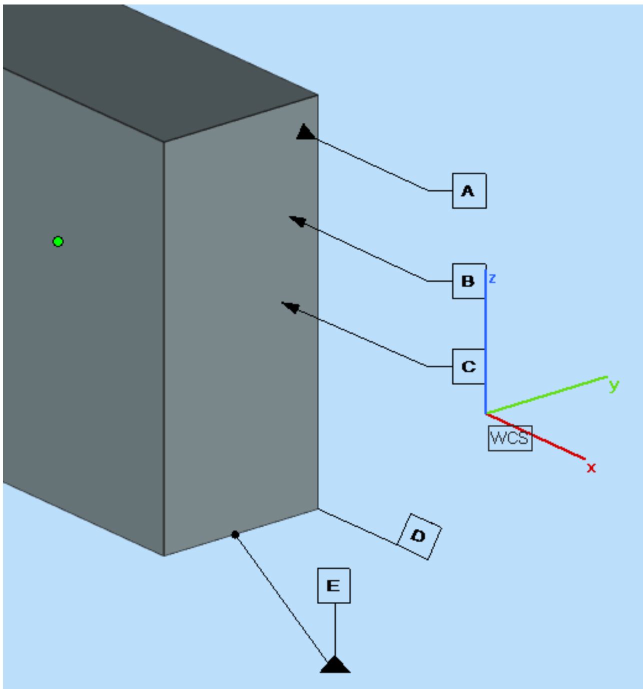

PMI is a set of data used to describe the technical specifications of a part that will be produced. This data can be added in 3D directly on the part, when the part is being designed in CAD, and saved together with the part in the proprietary file format. Magics has extended its import and can load not only the CAD part, but also the PMI information that has been added on the part, in the CAD software, during the design of the part. With it dimensions and annotations can be visualized. These measurements or annotations cannot be edited in Magics.

The following PMI elements can be loaded in Magics:

- Dimensions

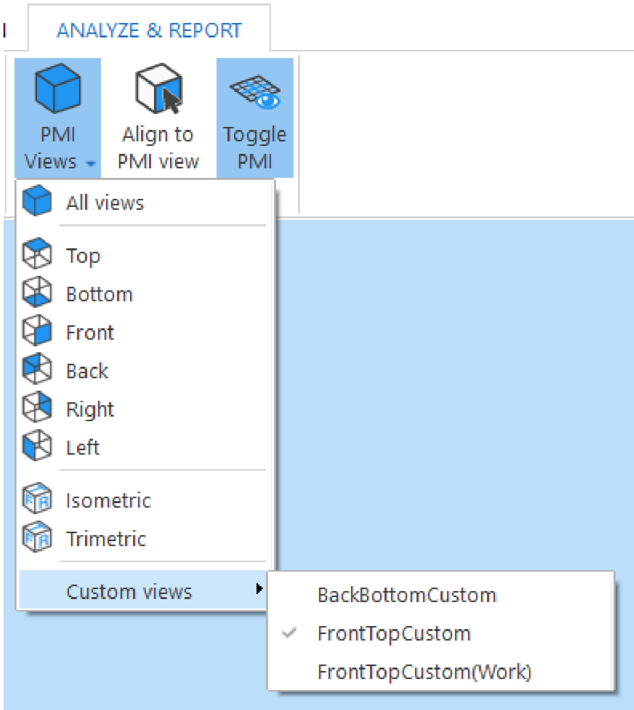



- Annotations




Note: This extended import is possible only with the NX and Solidworks import modules and only if the part has, in fact, been saved with PMI information.

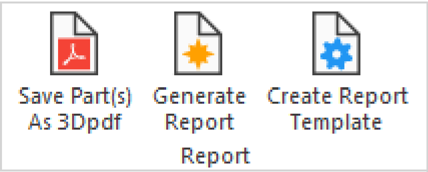
Under the “Analyze & Report” tab the PMI section can be found. It consists of three main commands as shown below.




| | |
|---|---|
| PMI Views | Allows the user to choose a specific view for the part or show them all. |

| | | |
|---|---|---|
| | All views | Shows all measurements and annotations that were placed on the part. |
| | Default views (Top, Bottom, …) | Enables the user to switch between the default views of a part. Note: If the coordinates of the default views are different in the CAD software than in Magics, then these views will appear under Custom Views. |
| | ISO, Trimetric | Enables the user to quickly switch between Isometric and Trimetric views. The note from default views applies. |
| | Custom views | Shows the views that have been created by the user inside the CAD software. |
| Align to PMI view | | Re-aligns the part to the previously selected view. |
| Toggle PMI | | Shows/hides all PMI measurements/ annotations. |

## 9.5 Report




### 9.5.1 Save Part(s) as 3Dpdf


Save the selected part(s) as 3Dpdf.

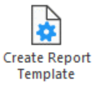
— See Save Part(s) As 3D PDF, page 77

### 9.5.2 Generate Report


Generate a Report in a document.

— See Generate Report, page 64

### 9.5.3 Create Report Template




Create a report template in Microsoft Word or Microsoft Excel.

— See Create Report Template, page 64

# 10 Chapter 10: Slicing


## 10.1 Slice Preview

Visualize the slices' contours and hatchings on the part(s). (ALT+P)

— See Slice Preview, page 739

## 10.2 Slice All

Slice all parts on the current scene.

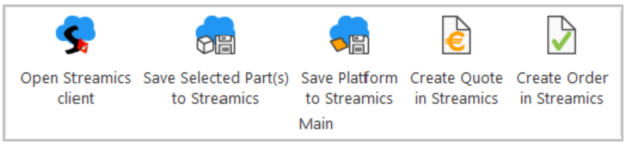
— See Chapter 7: Slicing, page 737

## 10.3 Slice Selected

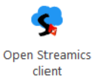
Slice the selected part(s). (CTRL+I)

— See Chapter 7: Slicing page 737

# 11 Chapter 11: Materialise Software

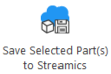



## 11.1 Open Streamics client



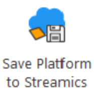

Opens the associated Streamics Clients. The client can be associated in the settings. (Settings – Modules – Streamics Client)

### 11.1.1 Save Selected Part(s) to Streamics



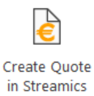

Saves the selected part to the Streamics Control System.

### 11.1.2 Save Platform to Streamics Main



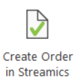

Saves the active platform to the Streamics Control System.

### 11.1.3 Create Quote in Streamics



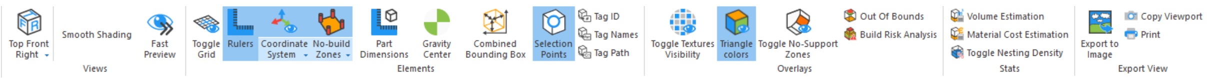

Create a quote from the selected part(s) in Streamics.

### 11.1.4 Create Order in Streamics

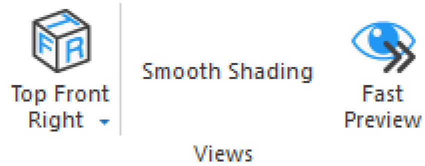



Create an order from the selected part(s) in Streamics.

# 12 Chapter 12: View

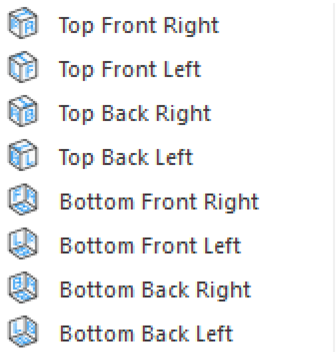



## 12.1 Views

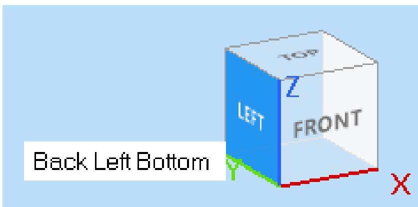



### 12.1.1 ISO views


This dropdown allows you to access the following views:




These views are also accessible by hovering over the corners of the interactive view cube, situated at the bottom right of the scene.



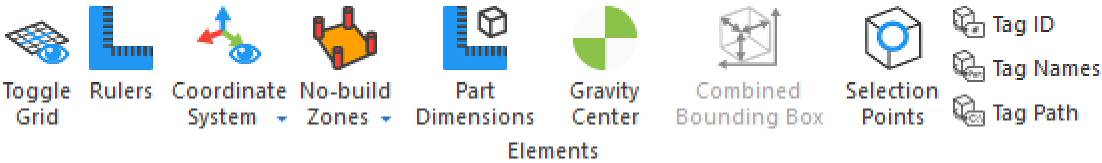

### 12.1.2 Smooth Shading

When Smooth Shading is enabled, the variations in color will be shown more gradually and no longer as separate triangles. Note that only the visualization of the part changes, the number of triangles and the accuracy of the STL are not changed.

### 12.1.3 Fast Preview

Fast Preview allows the application to only render wireframes or points of parts. It will speed up the visualization of 3D views.

## 12.2 Elements




### 12.2.1 Toggle Grid

Toggles the visibility of the grid.

— For grid settings, see paragraph Grid.

### 12.2.2 Rulers

Toggle the visibility of the Rulers. Rulers have been introduced into Magics to give the user the possibility to estimate the dimensions in which he is working. The rulers can be placed at the bottom of the working area and/or in the left side of the working area.

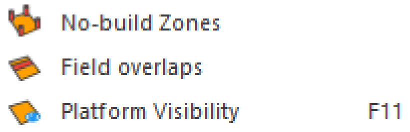
These settings can be defined in the Rulers visualization parameter window (Settings > Visualization > Rulers).

### 12.2.3 Coordinate System

The Coordinate System is called WCS (World Coordinate System) and it is the default coordinate system in which you work. The origin is set in (0,0,0).

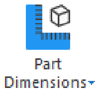
Sometimes, for example when the part is zoomed in, or when the part is positioned far from the origin, this coordinate system is not visible on the screen. Therefore, you can switch on the Orientation Indicator.

### 12.2.4 No-build zones



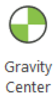

| | | |
|---|---|---|
| No-build Zones | | Toggle to show the No-build zones, if present. |
| Field Overlaps | | Toggle to show Field overlaps, if present. |
| Platform Visibility | | Toggle the Platform Visibility. (F11) |

### 12.2.5 Part Dimensions



Activating the part dimensions gives a view on the bounding box with the dimension of each rib indicated.

### 12.2.6 Gravity Center



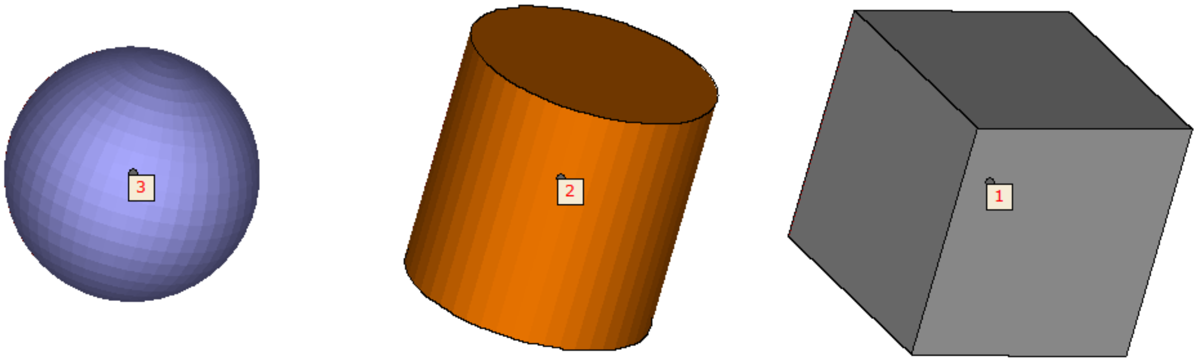
This command visualizes the gravity center of the selected part with a green dot.

### 12.2.7 Combined Bounding Box

This command toggles the visibility of the bounding box of all selected parts. In addition, every minimum and maximum value of x, y and z are shown.

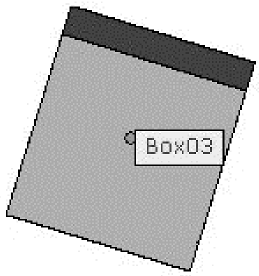
### 12.2.8 Tag ID

Every loaded part receives an ID in Magics, with this functionality it can be visualized.



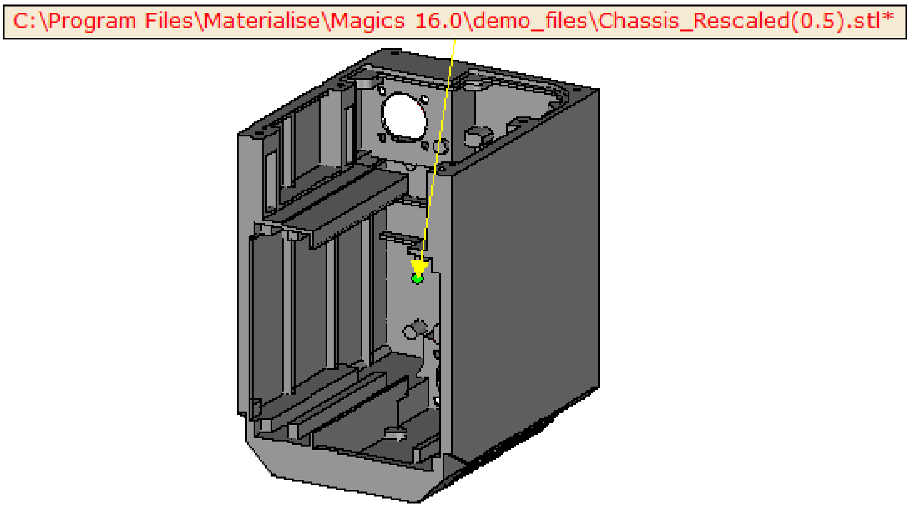

## 12.2.9 Tag Names

Tag Names This command pasts the name of the part to the selection tag of the part. (F10)



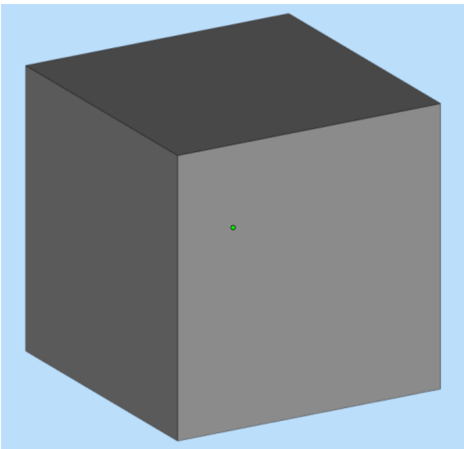
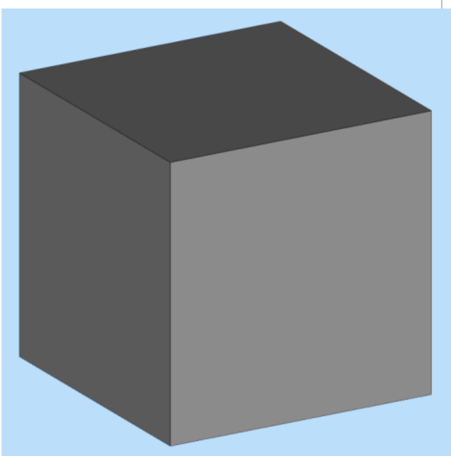

## 12.2.10 Tag Path

Tag Path By selecting this, it shows the path of the part nears its selection tag. (F12)

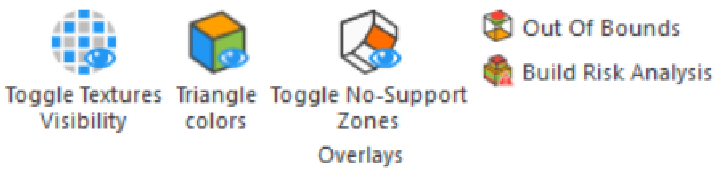



### 12.2.11 Selection Points


This command hides or shows the selection points on the parts. This can be useful if the user wants to take screenshots of his parts.

| *On* | *Off* |
|---|---|
|  |  |

## 12.3 Overlays

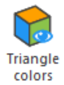


### 12.3.1 Toggle Textures Visibility

Toggle Textures Visibility.

— See Toggle Textures visibility, page 188

### 12.3.2 Triangle Colors



Show/Hide the painted colors (triangle & vertex color) of the part(s) in the current scene.

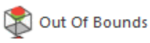
— See Triangle Colors, page 190

### 12.3.3 Toggle No-Support Zones

Toggle the visualization of the No-Support Zones.

— See Toggle No-Support Zones, page 515

### 12.3.4 Out of Bounds



The out of bounds function will color parts which are placed outside of the platform bounds. Any placement tool can be used without losing the color indications

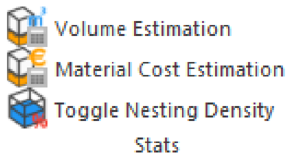
— See Out of bounds, page 276

### 12.3.5 Build Risk Analysis

Visualize the risk of failure or distortion on the selected part(s) according to the slice distribution.

— See Build Risk Analysis, page 289

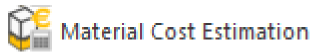
## 12.4 Stats




### 12.4.1 Volume Estimation


Show an estimation of the materials volume of the selected part(s). When toggled the icon gets a blue background.

### 12.4.2 Material Cost Estimation

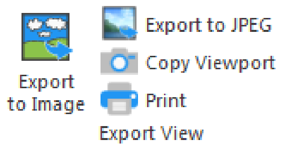



Show an estimation of the material cost of the selected part(s). When toggled the icon gets a blue background.

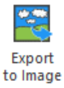
### 12.4.3 Toggle Nesting Density


Show/hide the nesting density of the current platform. When toggled the icon gets a blue background.

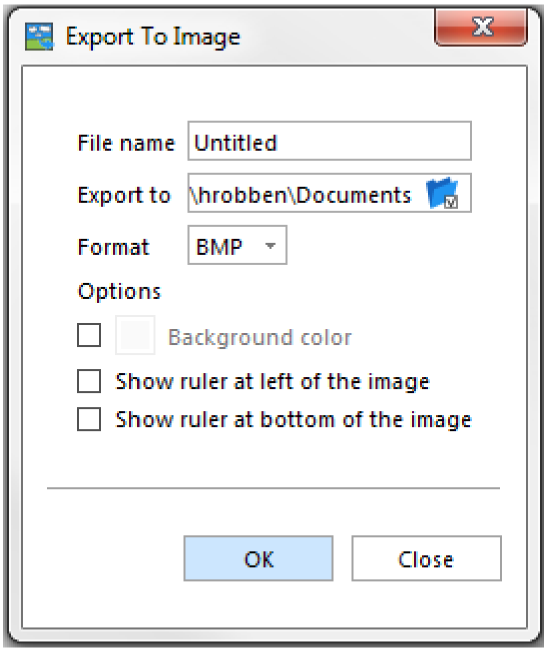
## 12.5 Export View



### 12.5.1 Export to Image



The current view can be exported as Bitmap, GIF, JPEG, TIFF, PNG file. You can enable the rulers and choose a background color. When no background color is selected, the color of the scene will be used.




### 12.5.2 Copy Viewport

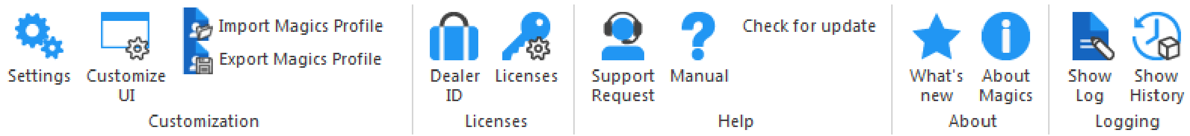
. To make screenshots of the Main Window, you can use this feature.

### 12.5.3 Print

This command starts the Magics print wizard that leads you to the Page Setup and the standard Windows Print dialog box.

- See Print, page 78

# 13 Chapter 13: Options & Help

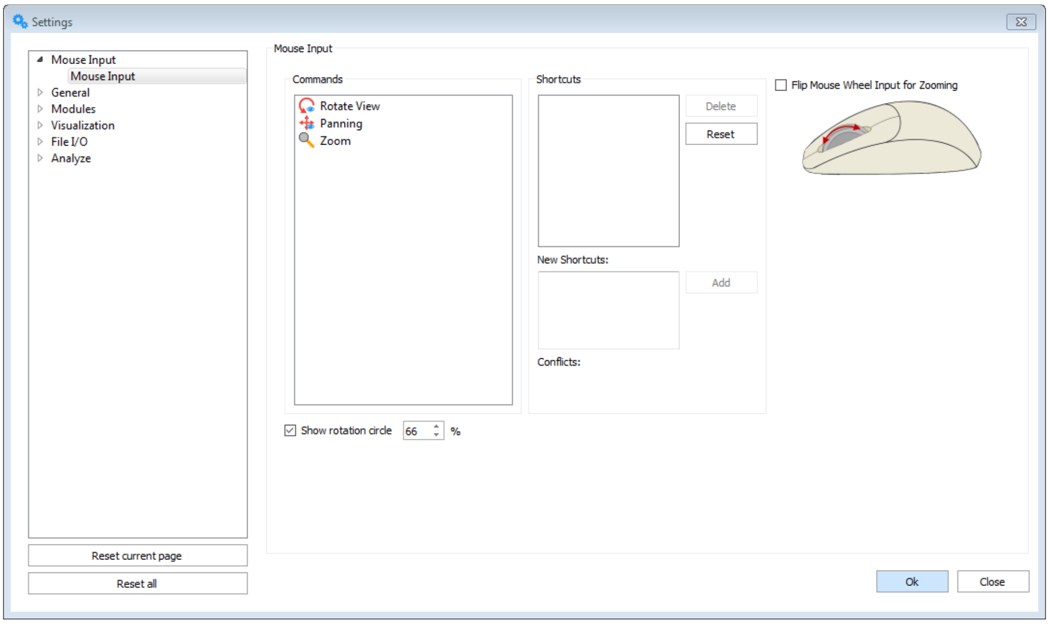



## 13.1 Settings

In the Settings dialog you can alter all parameters of your Magics Software.

### 13.1.1 Customize Mouse Input

The mouse buttons are fully customizable by the user.

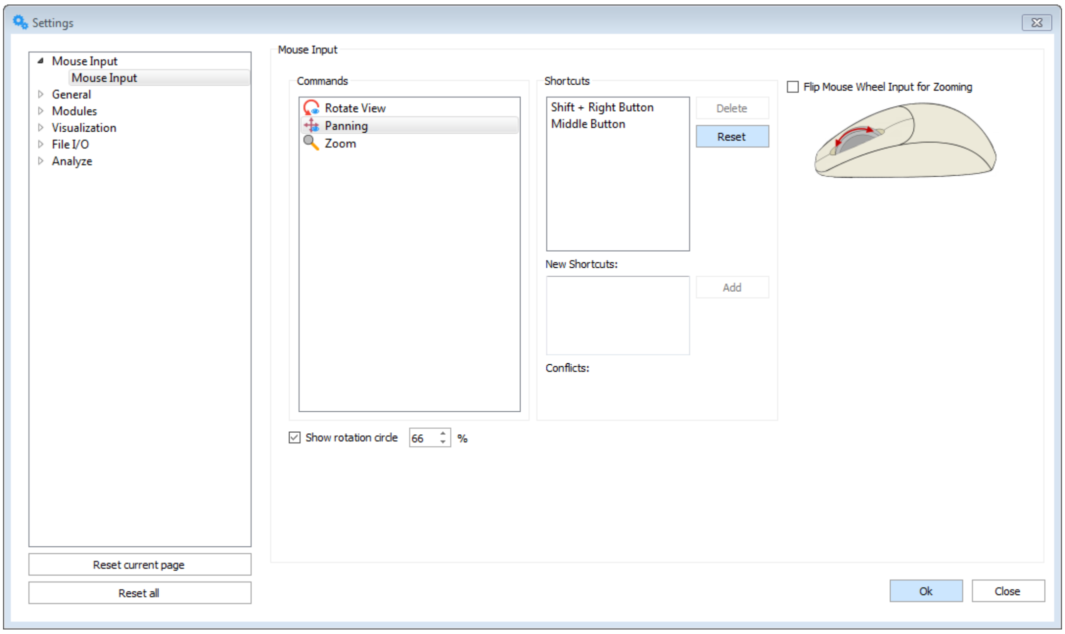



| | |
|---|---|
| Command | This list contains the available functions for the mouse. |
| Shortcuts | This list represents the current shortcuts for the selected function in the Function List. |
| Delete | Deletes the selected shortcut. |
| Reset | The shortcuts for the selected function will be reset. |

| | |
|---|---|
| New Shortcut | By clicking in this textbox and clicking on the desired combination of (mouse) buttons, the shortcut will appear in this box. |
| Add | Adds the shortcut to the Shortcuts List. |
| Conflicts | This message alerts whether a shortcut for the selected function is in conflict with another shortcut of another function. |
| Apply | Designates the shortcut to the selected Command, the user is able to define more shortcuts without leaving the dialog. |

### 13.1.1.1 Advised Way of Working

— Select a command from the Command list. E.g. Panning. Panning already has a shortcut: SHIFT+Right Button and the middle mouse button. We'll create a new one.




— Activate the New Shortcut textbox by clicking in it and push your desired shortcut.
— Click on the ***Add*** button, the shortcut is added to the Shortcut List.
— Click ***OK***. You can now use your newly created shortcut.

### 13.1.1.2 "Flip Mouse Wheel Input for Zooming" checkbox

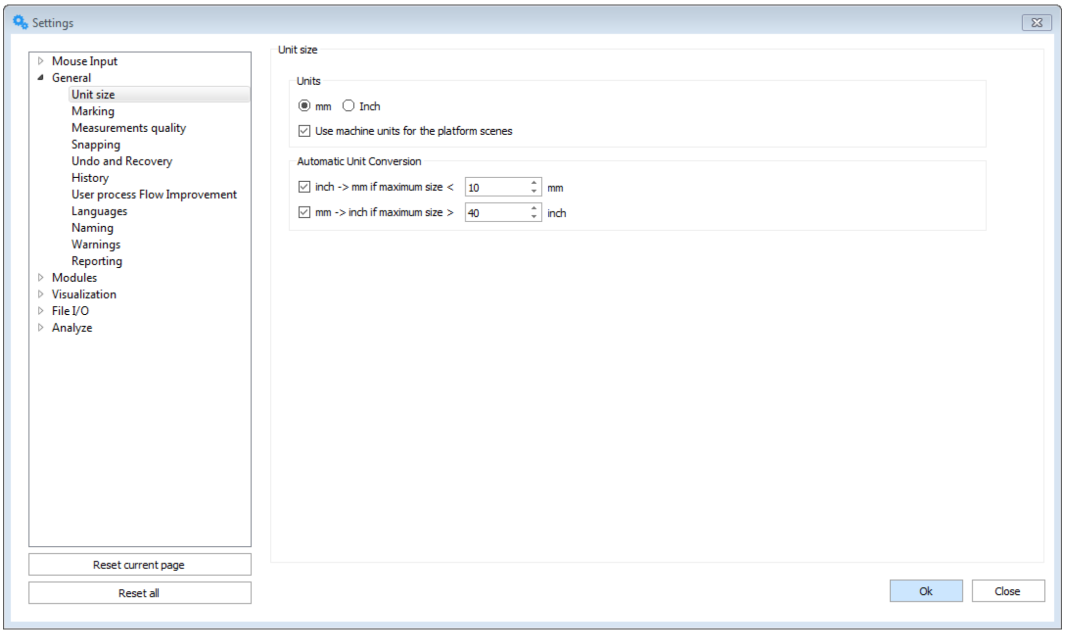
Allows the user to change the direction of the zooming behavior by the use of the mouse wheel.

### *13.1.1.3 "Show rotation circle" checkbox*

Allows the user to decide whether or not to show the rotation circle on screen during rotation of the view. The size of the rotation circle can be adjusted to fit the user needs.

## 13.1.2 General

### *13.1.2.1 Unit Size*




#### 13.1.2.1.1 Units

You can choose between mm and inches. You will have to select the units before you load the STL file. If the STL file was originally in millimeters, you have to choose mm. If the file is in inches, you will have to choose Inch. If several parts are loaded, some in millimeters and some in inches, the Unit Conversion has to be used otherwise parts are out of proportion. The program always remembers the last used unit and takes this as default the next time you start up the program.

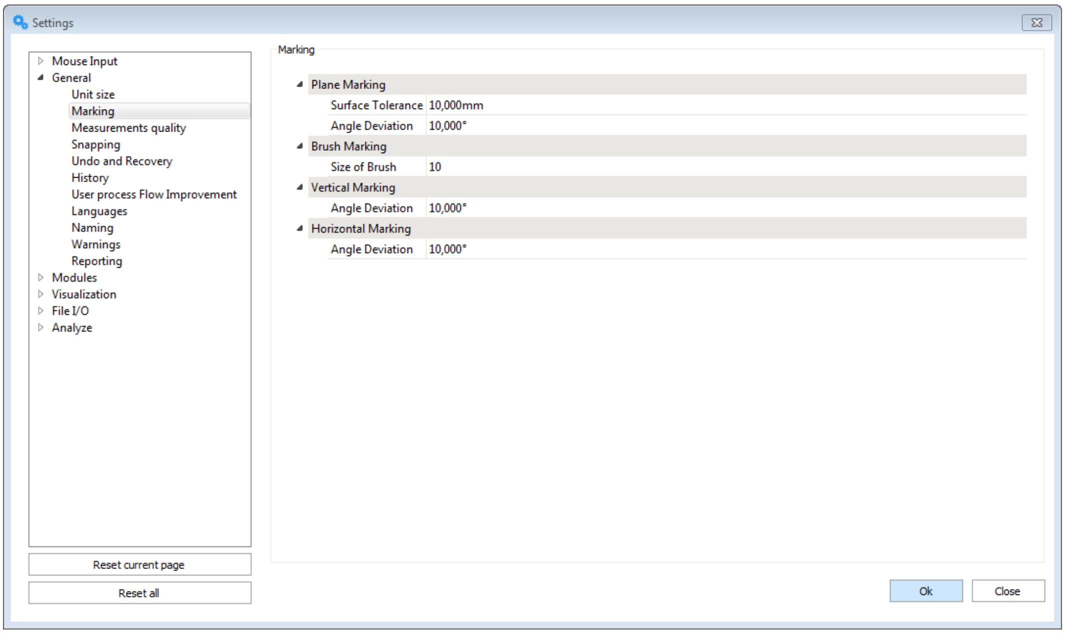
#### 13.1.2.1.2 Automatic Unit Conversion

The automatic unit conversion is used to avoid mistakes due to the units you work in. It may be that you are working in millimeters, and that you load a part whose dimensions are expressed in inches. A part of 2inch*2inch*2inch, will then become a part of 2mm*2mm*2mm. The size of the part is not correct anymore.

Because 1inch is 25.4mm, the dimensions of the part expressed in millimeters are bigger than those when the part is expressed in inches. A part of 2inch*2inch*2inch, is as big as a part of 50.8mm*50.8mm* 50.8mm.

When you are working in millimeters and you load a part and the dimensions are very small (you can define 'very small' in the options –see the figure above), it may be that the part you loaded was originally expressed in inches. Magics will then multiply the dimensions with 25.4 (inch to mm conversion), so the part will now be expressed in millimeters. When you are working in inches and you load a part and the dimensions are very big (you can define 'very big' in the settings – see figure above), it may be that the part you loaded was originally expressed in millimeters. Magics will then divide the dimensions with 25.4, so the part will now be expressed in inches.

### *13.1.2.2 Marking*




#### 13.1.2.2.1 Plane marking

These parameters describe how accurate the program should search for triangles in one plane. - See Marking tools, page 378.

#### 13.1.2.2.2 Brush Marking

| | |
|---|---|
| Size of Brush | Brush Marking allows marking triangles on an active part by a brush. The user can define the size of the brush. |

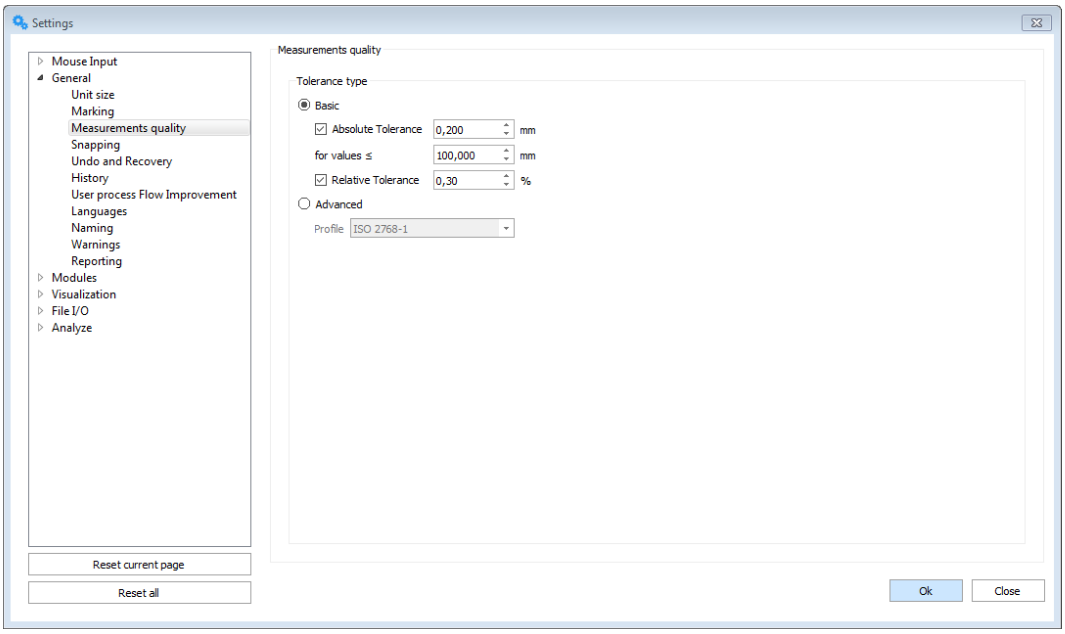
#### 13.1.2.2.3 Vertical Marking

| | |
|---|---|
| Angle deviation | Vertical Marking allows marking triangles on an active part vertically. The user can define the deviation. |

#### 13.1.2.2.4 Horizontal Marking

| | |
|---|---|
| Angle deviation | Horizontal Marking allows marking triangles on an active part horizontally. The user can define the deviation |

### *13.1.2.3 Measurements Quality*

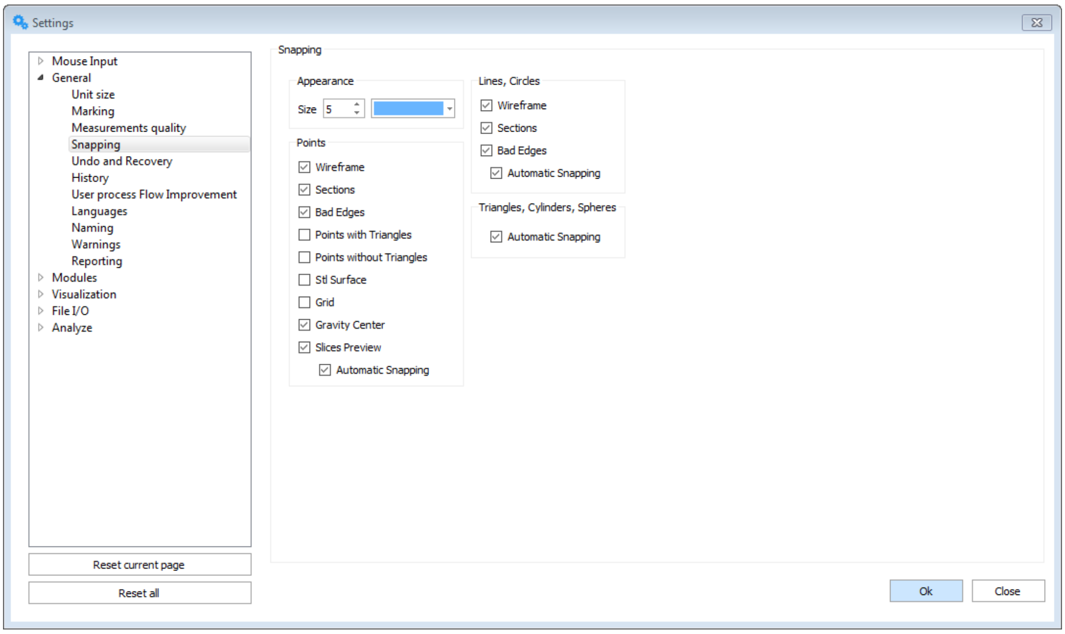



| Measurements quality | | |
|---|---|---|
| Basic | A simple quality measurement is performed based on the parameters: relative tolerance and absolute tolerance. | |
| | Absolute tolerance | Specify the tolerance for the absolute deviation from the real measurement compared to the STL measurement. |
| | For values | Only check for values that are smaller or equal to the entered value. |
| | Relative tolerance | Specify the tolerance for the relative deviation from the real measurement compared to the STL measurement |
| Advanced | An advanced quality measurement is performed based on a defined profile. | |

| | | |
|---|---|---|
| | Profile | Specify which profile has to be used to check the quality of the measurement(s). The profile is an *.xml document saved in the ‘Advanced Tolerance’ folder. (Settings > File I/O >Working folders > Advanced measurements) |

*13.1.2.4 Snapping*

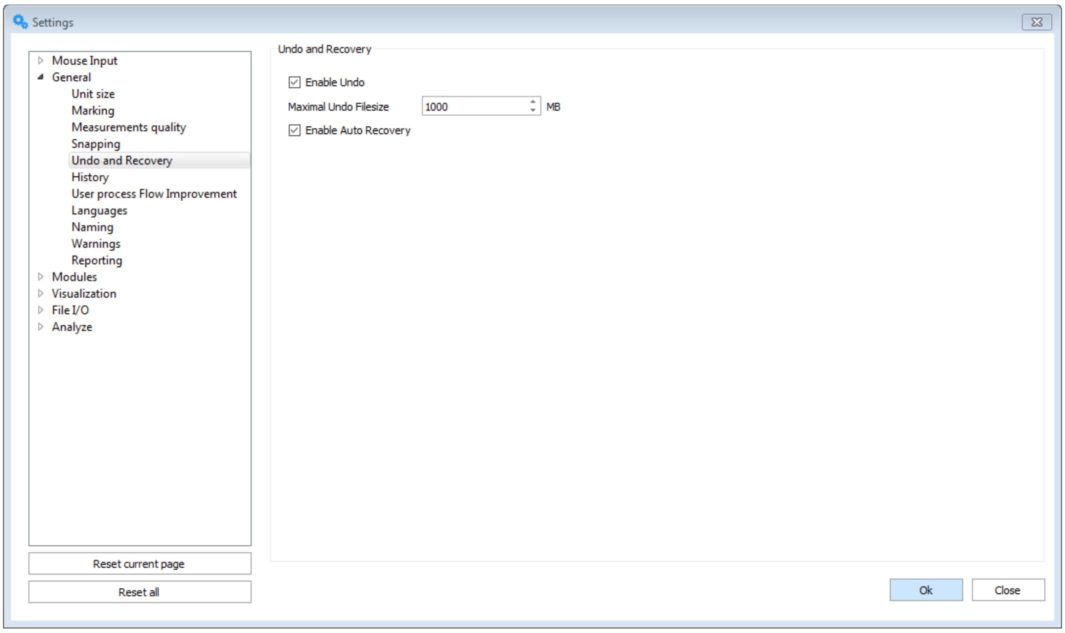
Some functions in Magics RP (for example measuring and aligning) require that you snap to a feature of the part: a point, a line, a plane, a circle, a cylinder, and sphere.




| | |
|---|---|
| Appearance | When you snap to a feature, the feature will be marked. A point is indicated with a colored circle with a radius as set in the size box. A snapped line and circle will get the color marked in the color box. If you snap to a plane, the contours of a triangle in that plane will be highlighted in the selected color. A snapped cylinder and sphere will be indicated in the selected color. |
| Points | You can decide which points you can snap to: points on a wireframe, sections, bad edges, points that form the corner points of a triangle, free points (points that are not a corner point of a triangle), points on the STL surface and/or points on the grid.<br>When you for example unselect wireframe, you will not be able to snap a point that is laying on a wireframe.<br>Automatic snapping: |

| | |
|---|---|
| | — ON: When this option is marked, Magics actively searches for points when you move the mouse over the part. Magics will highlight these points. To select a point, click on it.<br>— OFF: Magics will only search for a point when you have clicked with the mouse. This option is faster. |
| Lines, circles | You can decide which lines and circles you can snap to: lines and points on a wireframe, sections and/or bad edges.<br>When you for example unselect wireframe, you will not be able to snap a line that is part of the wireframe.<br>Automatic snapping:<br>— ON: When this option is marked, Magics actively searches for lines and circles when you move the mouse over the part. Magics will highlight these lines and circles. To select a line or a circle, click on it.<br>— OFF: Magics will only search for lines and circles when you have clicked with the mouse. This option is faster. |
| Triangles, Cylinders, Spheres | Automatic snapping:<br>— ON: When this option is marked, Magics actively searches for cylinders and spheres when you move the mouse over the part. Magics will highlight these cylinders and spheres. To select the cylinder or sphere, click on it.<br>— OFF: Magics will only search for a cylinder or sphere when you have clicked with the mouse. This option is faster. |

### 13.1.2.5 Undo and Recovery



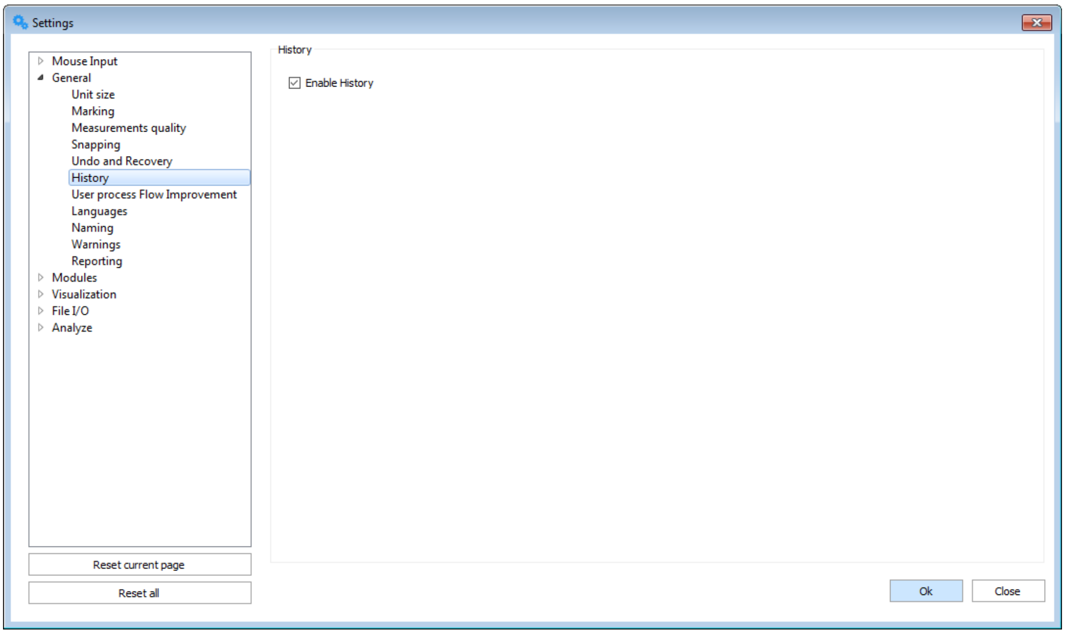
| | |
|---|---|
| Enable Undo | Default this option is ON. A file, that keeps the history of the operations you do on an STL file, is made. This allows an undo operation. When you close Magics, the undo file of that session is erased. |
| Maximal Undo File size | You can enter a maximum size of the file where the operations you do are saved. When the file size gets too big, the descriptions of the first actions you did in Magics will be removed. The default value is 250 MB. |
| Enable Auto Recovery | After a crash, Magics will ask you if you would like to go back to the previous status, if Auto Recovery is enabled. You can only recover when you enabled undo. During a crash the undo file will not be erased in this case. An Auto Recovery will search for the undo file of your last session when you start up Magics again. When the option is OFF, he will not search the file, and he will not be able to offer you a recovery. |

*Remarks*:

- The Undo and Auto Recovery files can be found in the sub-directory 'Magics RP Undo' of the regular Windows temporary directory.
- When you enabled the Auto Recovery option it is possible that during a crash this recovery file gets corrupted. When Magics wants to start he will ask if you want to recover. If the recovery file is corrupt, Magics might not be able to open. Do not choose to recover the next time or go to the standard Windows Temporary '\Magics RP Undo'-folder and delete the file.

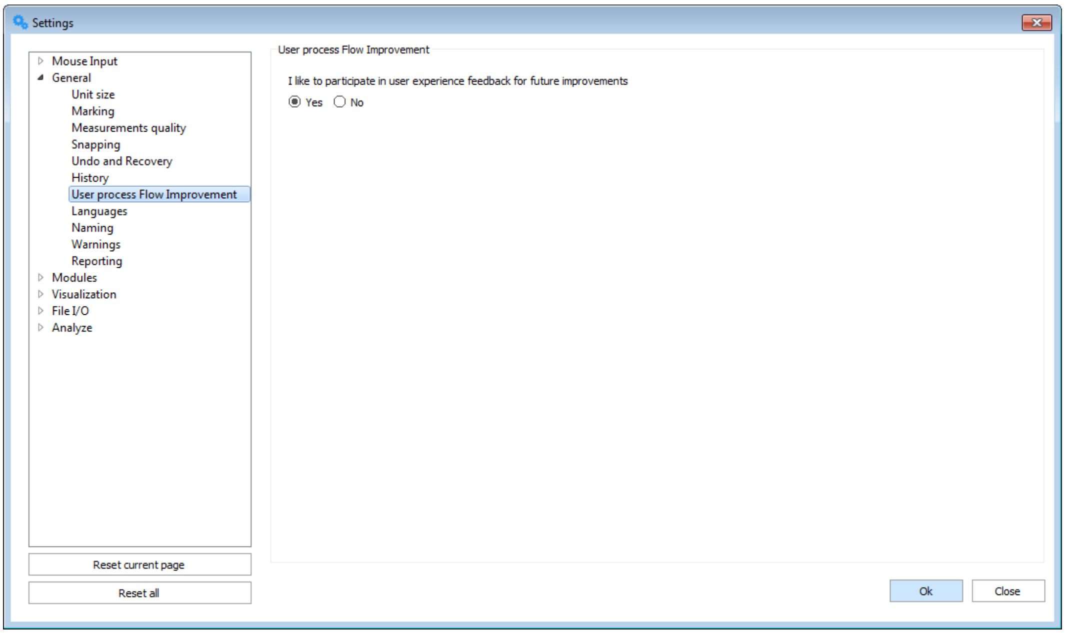
#### *13.1.2.6 History*

Magics RP keeps a track of the history of every part once an operation is performed. Enabling this option can slow Magics down. By default this option is ON.



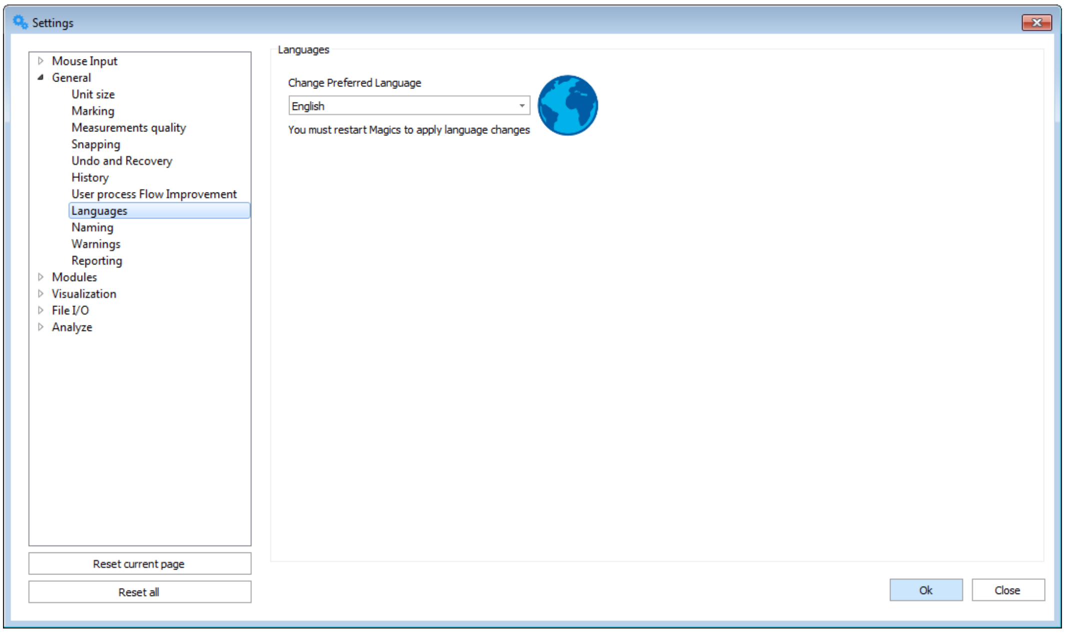

### 13.1.2.7 User process Flow Improvement

Magics will collect user experience feedback to ensure future improvements and best software quality.



### 13.1.2.8 Languages

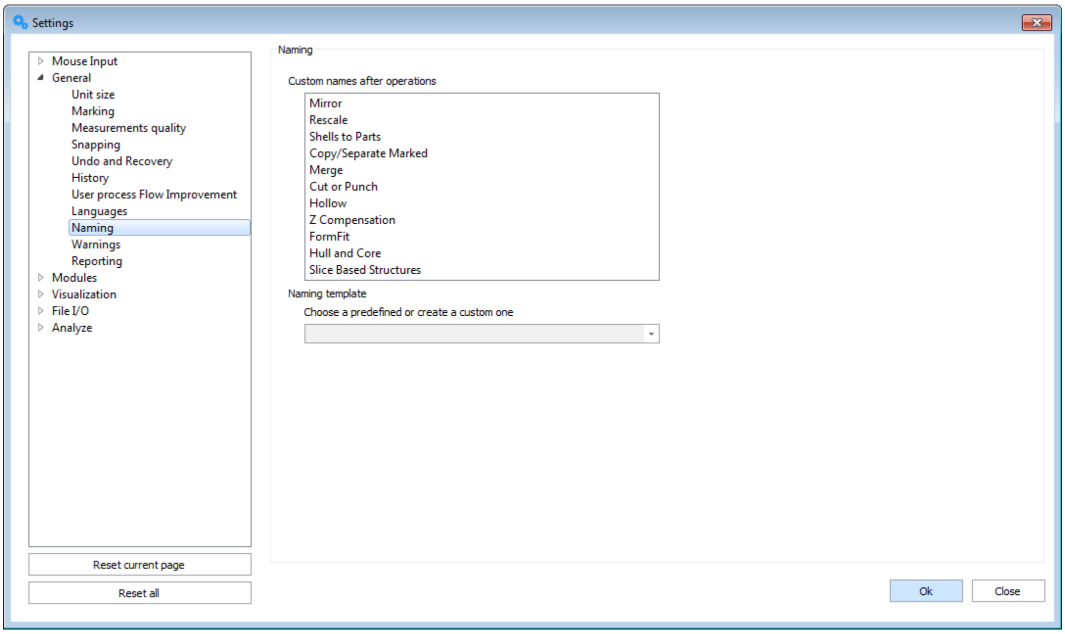
You can change the language of you Magics installation. The language change is only applied after restarting Magics.

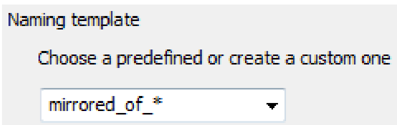



### 13.1.2.9 Naming

The part name changes after performing certain actions in Magics. The name change is initially introduced to keep an overview of the performed actions on the part.

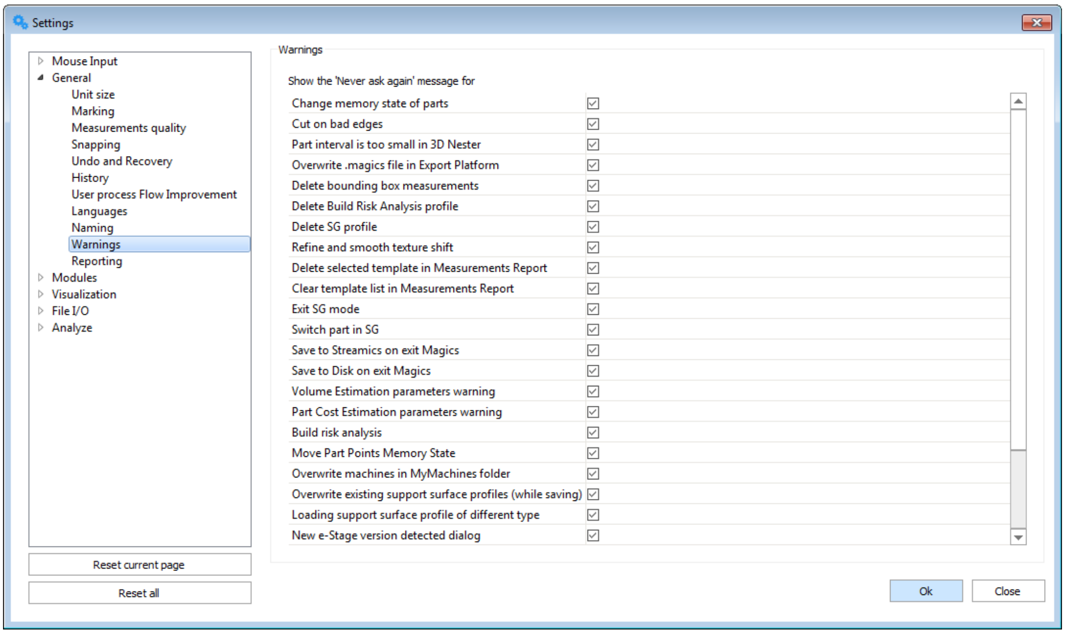
The name setting of your part can be customized so that this matches your workflow.




| | |
|---|---|
| Custom names after operations | For every functions in this list you can specify the used naming convention |
| Naming template | A suffix can be selected from the list or customized suffixes can be created, keeping some rules in mind.<br><br>Symbols are standing for:<br>* : part name<br>#: index number<br>$p: parameter value<br><br>***Example***<br>Simple type the desired notation into the combo box. Magics will save this format into its preferences<br><br>Remark: Use only a '*' if no suffix is requested after the operation. |

### 13.1.2.10 *Warnings*

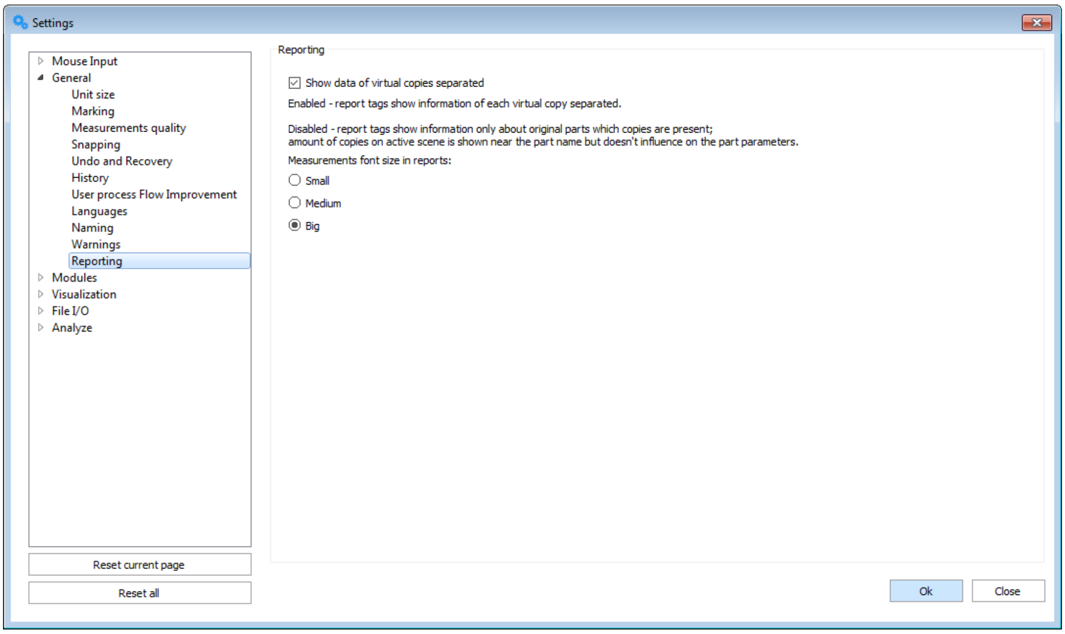
Turn warning messages on/ off for particular functions/ actions to complete.




### 13.1.2.11 *Reporting*

Show data of virtual copies separated.

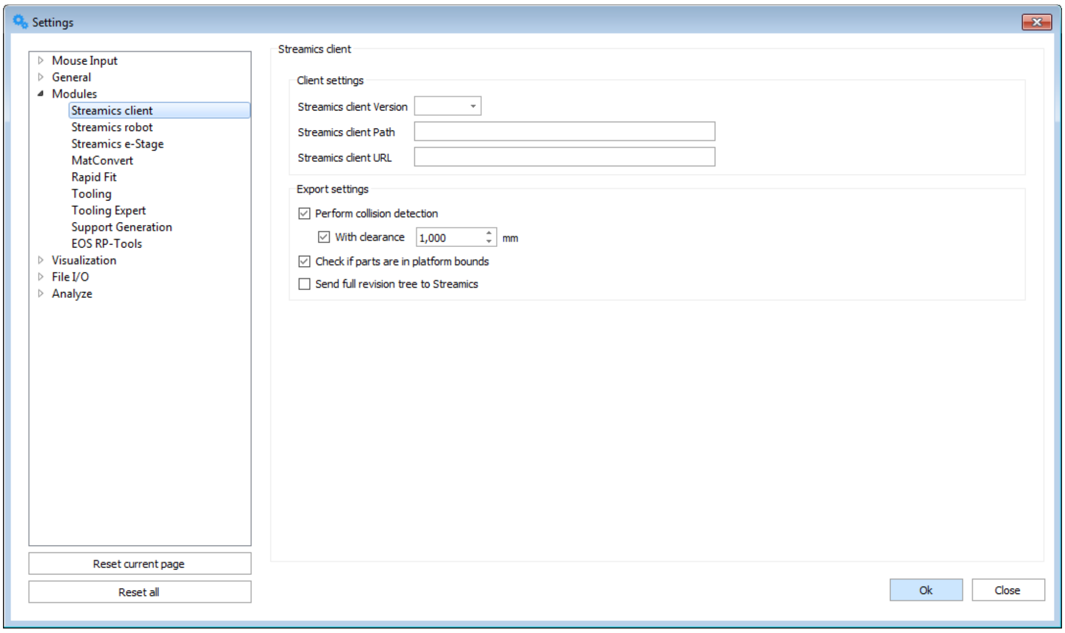
- Enabled: Report tags show information of each virtual copy separated.
- Disabled: Report tags show information only about original parts which copies are present; amount of copies on active scene is shown near the part name but doesn't influence on the part parameters.




## 13.1.3 Modules

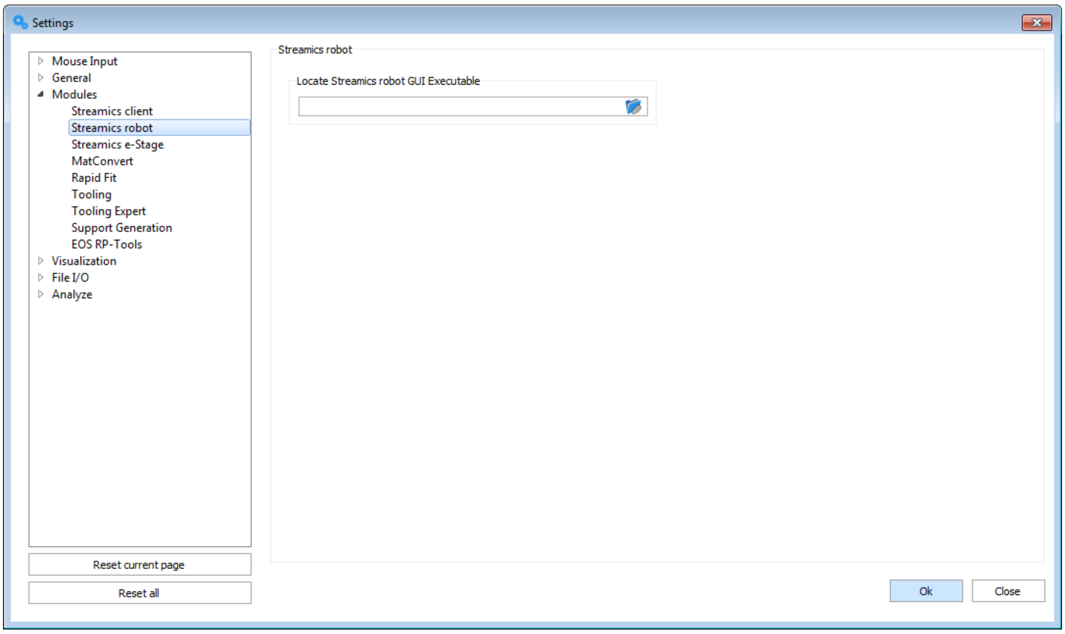
### *13.1.3.1 Streamics Client*

Here you can change the settings of the Streamics Client. It also enables the user to perform a collision detection and out of bounds detection check before uploading platforms to Streamics. In addition there is an option to change the revision settings between full mode and limited mode.

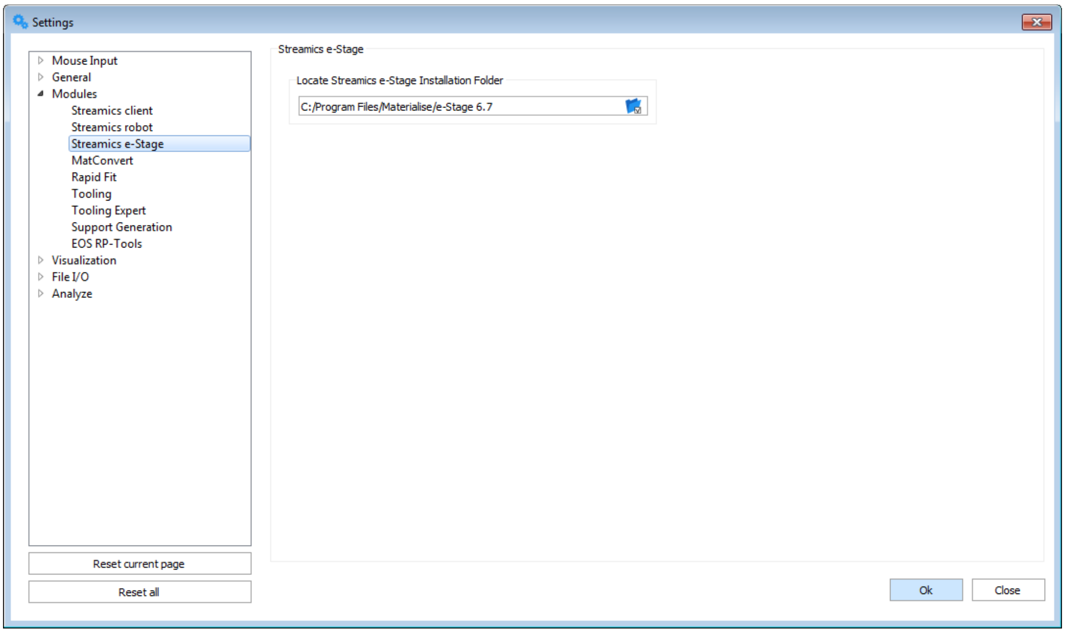


### 13.1.3.2 Materialise Robot

In this tab you can specify the installation folder of the Materialise Robot that you want to use for processing Robot content from Magics.



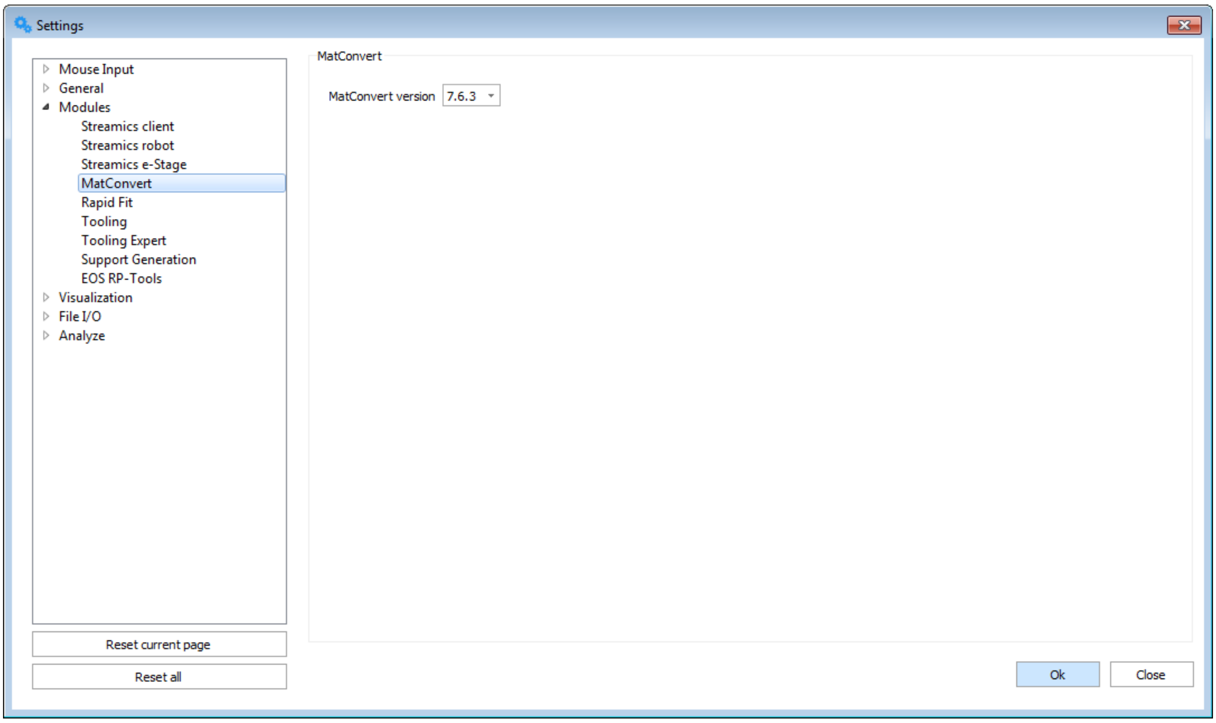

### 13.1.3.3 e-Stage



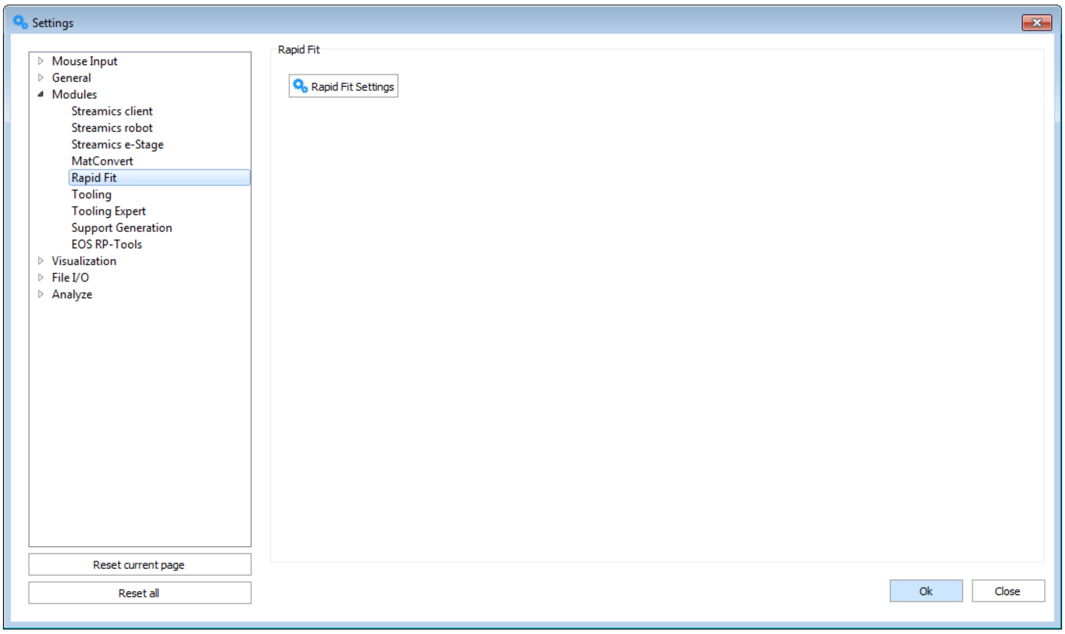
| | |
|---|---|
| Locate e-Stage folder | Location of e-Stage. The e-Stage link is only active in Magics when the path to e-Stage is defined properly. |

### 13.1.3.4 MatConvert

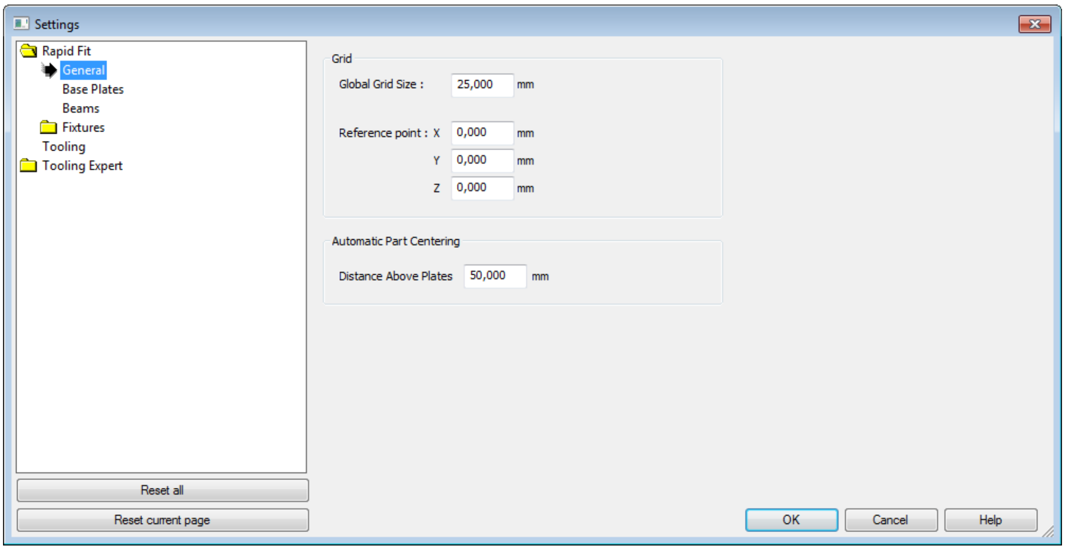
If you have multiple MatConvert versions installed on your pc, this setting will allow you to switch between different versions of MatConvert. This also allows you to upgrade your MatConvert to the latest release without installing a new Magics.



### *13.1.3.5 Rapid Fit*

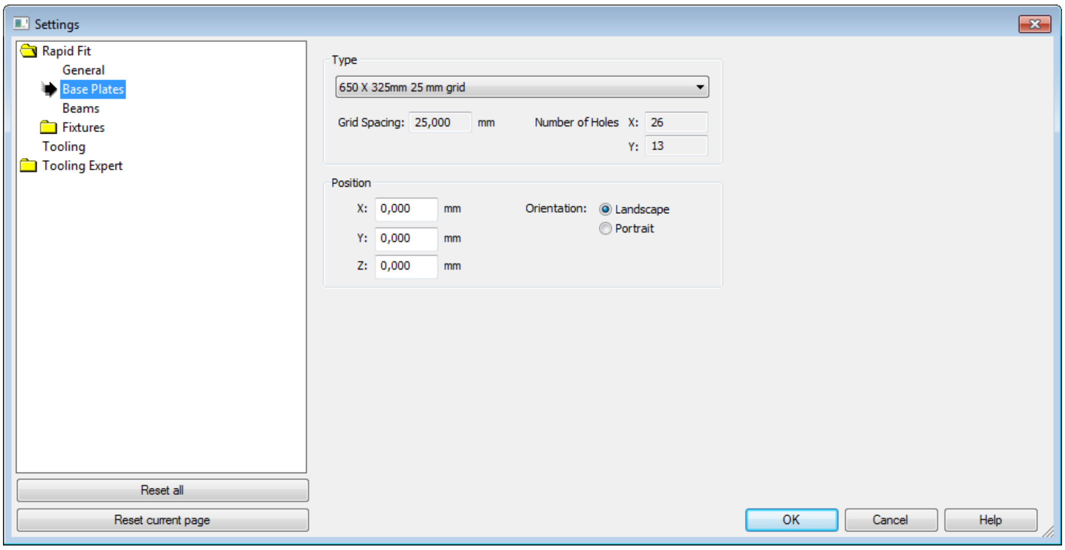



#### 13.1.3.5.1 General



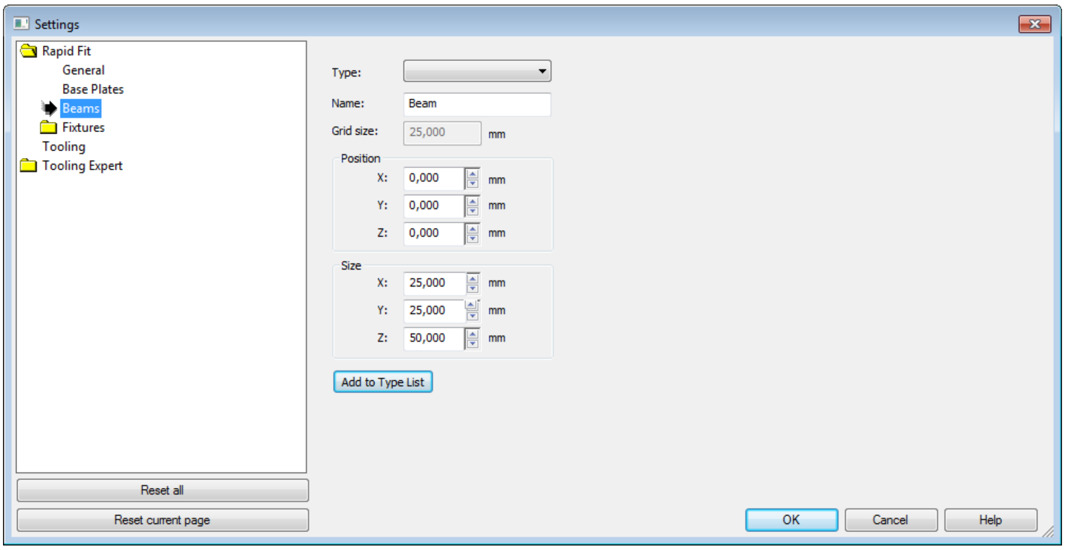

| | | |
|---|---|---|
| Grid | Global grid size<br>Reference point | The size of the grid<br>The position of the reference point |
| Automatic Part centering | The distance above the plates. | |

### 13.1.3.5.2 Base Plates




| | | |
|---|---|---|
| Type | The size of the base plate | You choose a Plate Type out of the list, which is filtered in baseplates linked to the chosen grid size. The Base Plates are standardized. The type mentions the size of the plate in X and Y and also the Grid size. |
| | Grid spacing | The grid Parameter is a property of a Plate Type and can thus not be changed. It is the distance between the centers of the threaded holes. The distance between the side edge and the first row of holes is half the grid Parameter. Therefore the size of the plate is a multiple of this grid parameter. |
| | Number of holes | The Number of holes in the plate is the size (here 325) divided by the grid spacing (here 25). |
| Position | This is the position of the hole with lowest X and Y coordinate. The orientation can be compared with Landscape and Portrait of a page setup in other programs. | |

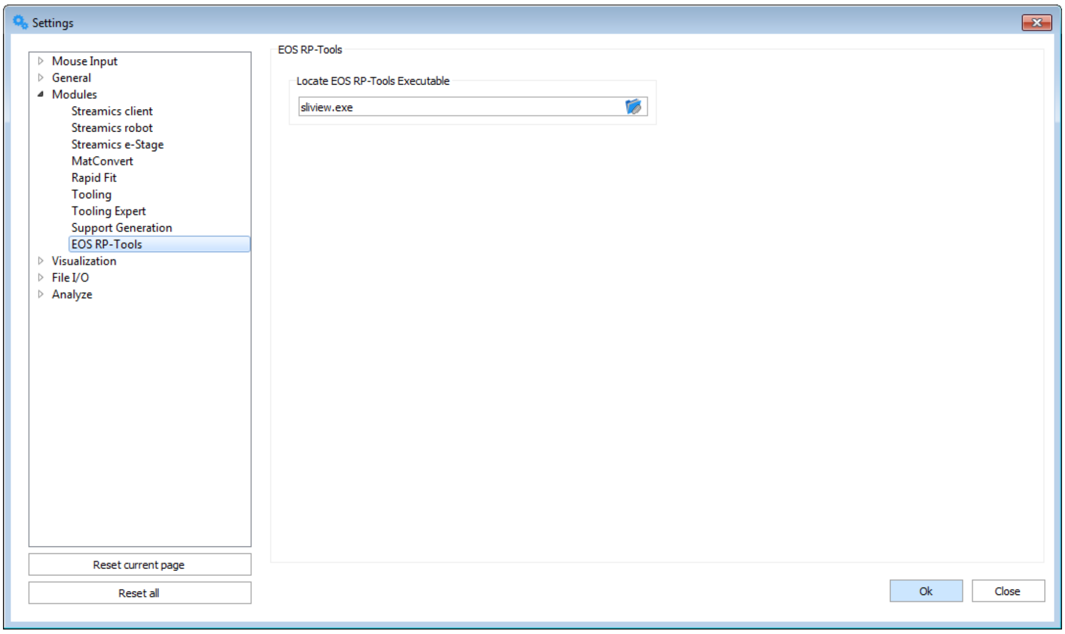
### 13.1.3.5.3 Beams




| | |
|---|---|
| Type | You can choose the type of beam you want |
| Name | The name of the beam can be changed |
| Grid size<br><br>Position<br>Size | The Grid Size of the Base Plate. The Grid Size indicates the step of the movement on the base plate.<br>The (x, y, z) position where the beam will appear.<br>The default size of the beam |

### *13.1.3.6 EOS – RP Tools*

The user can specify the installation folder of RP Tools here:



## 13.1.4 Visualization

### *13.1.4.1 Renderer*

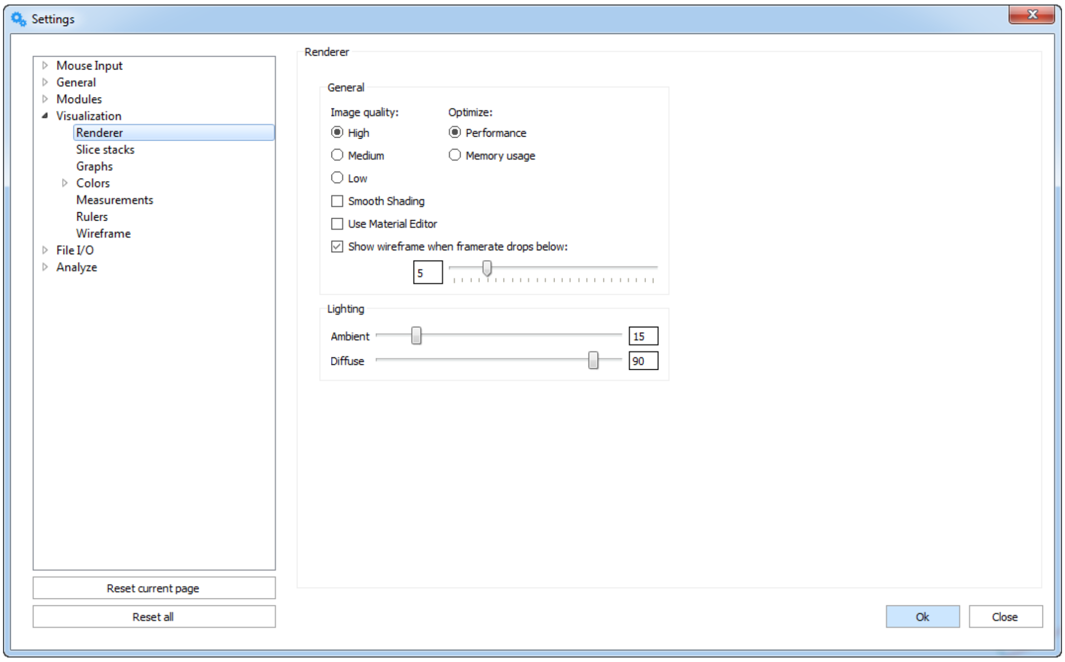
Modern video cards have specialized hardware to make rendering faster. Magics uses Direct 3D rendering. This will make rendering a lot faster because the CPU is not specialist in rendering and a 3D card is.

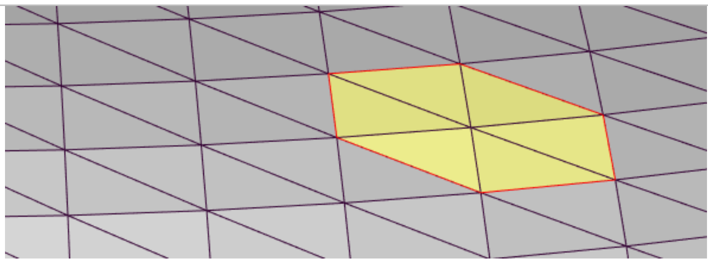
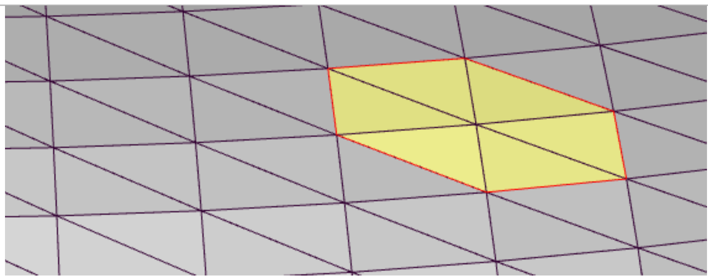
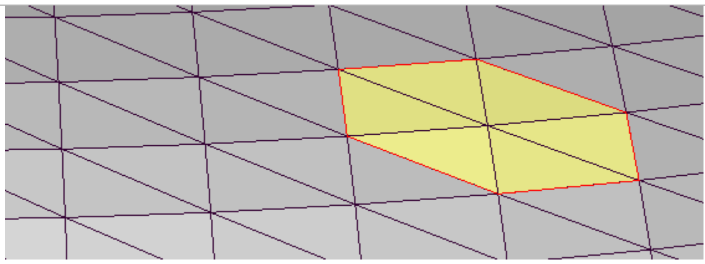
The principle is that the computer sends the triangles to the memory of the video card and the card will do the rendering of the part, following the instructions of Magics.

This has directly 2 consequences:

- To have optimal results, the memory on the video card must be large enough (1 MB STL needs approx. 1,5MB ram on the 3D-card).
- Each time the part has been changed, the whole list of triangles must be send again to the video card. This can cause delays depending of the size of the part. When you have a huge amount of triangles (millions of triangles), delays can be avoided by switching back to software rendering. Each 3D-card has a limit.

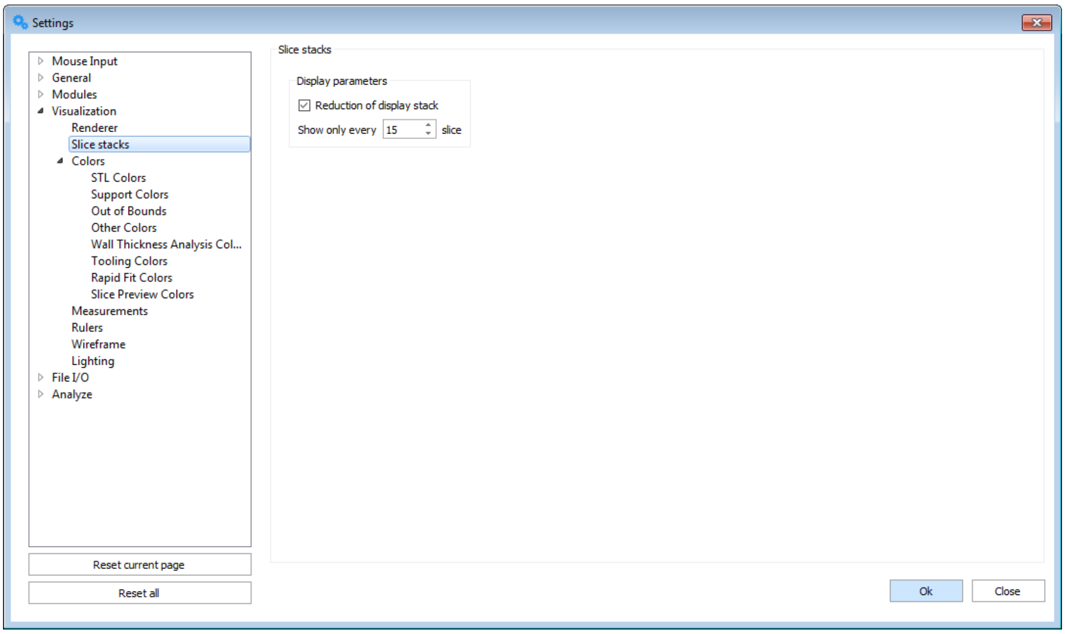
Remark: We recommend that you try each mode and see what the results are. Not only the hardware is important, but also the drivers. If you're having problems, try again with other (more recent) drivers.



| | | |
|---|---|---|
| Image quality | High |  |
| | Medium |  |
| | Low |  |
| Optimize | Performance | A copy of the triangles is saved on the memory of the graphics card, this should significantly speed up the rendering on most systems. |
| | Memory usage | The memory usage is limited when this option is flagged. The performance will be less though when working with large parts this option is best to choose. |
| Smooth shading | | The part can be visualized using smooth shading. The variations in color will now be shown more gradually and no longer as separate triangles. Note that only the visualization of the part changes, the number of triangles and the accuracy of the STL are not changed. |
| Use Material Editor | | OFF: When you click on the colored round in the part list sheet , a color palette appears.<br>ON: When you click on the colored round in the part list sheet, the material editor dialog appears. Besides the color, you can also select the material properties.<br>The colors can be described in 2 ways: RGB (red, green, Blue) and HLS (Hue, Lightness, Saturation). |
| Show wireframe when framerate drops below | | This flag allows the application to only render wireframes or points of parts when rotating the view thus interaction speeds up in the 3D-views. |
| Lighting | Ambient | This is the reaction to the ambient light that exists everywhere in the scene, this light is scattered equally in all directions on the surface. |
| | Diffuse | This is the reaction to directional light; it reflects more in one direction. |

### 13.1.4.2 Slice stacks

To speed up the process of visualizing slice stacks after import, the amount of slice stacks displayed at once can be specified in the settings.




| | |
|---|---|
| Reduction of display stack | Indicate how many slices of the full stack should be displayed. |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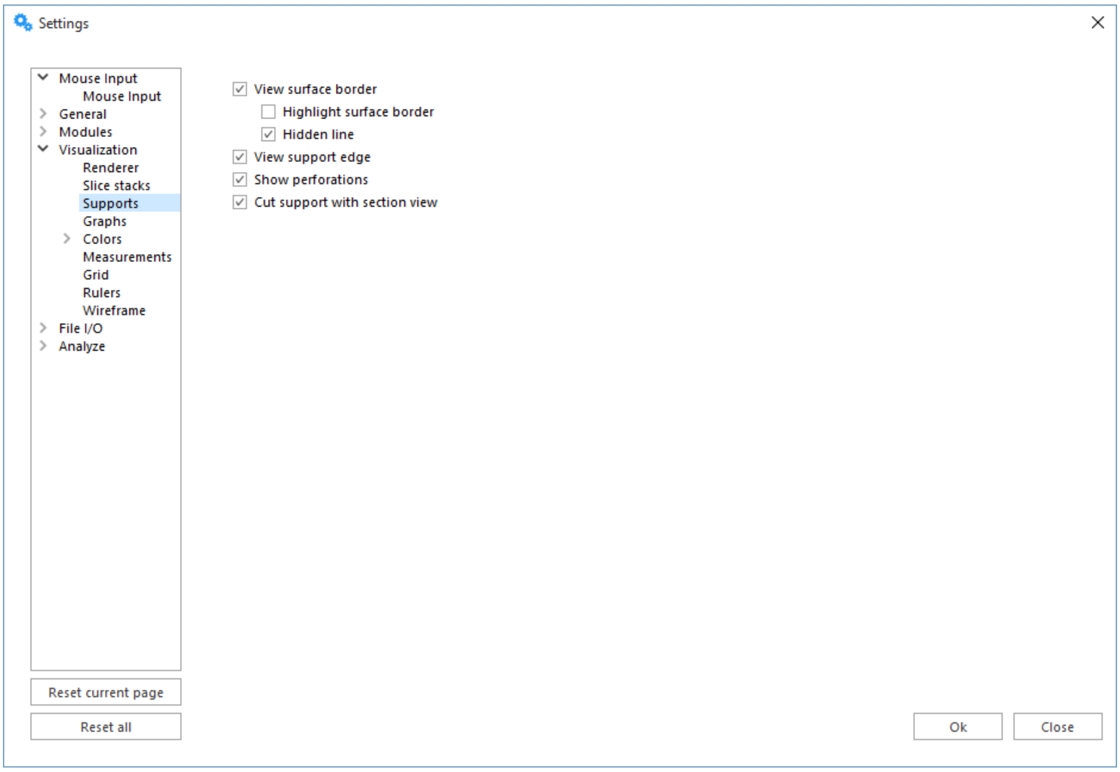
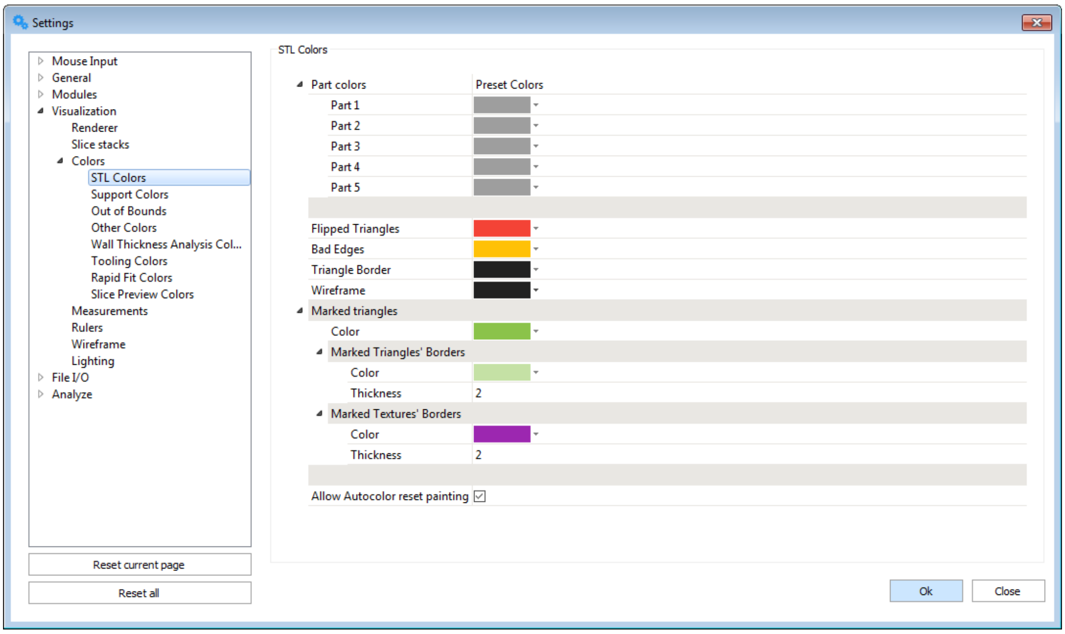
### *13.1.4.3 Supports*




| | |
|---|---|
| View surface border | The border of the surface where the selected support is trimmed on is visualized in yellow. |
| Highlight surface border | The border of the surface where the selected support is trimmed on is visualized with a thicker line. |
| Hidden Line | The line showing the surface border is only visible when it is in the front. |
| View support edge | The contact between Support and platform is visualized in yellow. |
| Show perforations | Perforations are shown |
| Cut support with section view | When enabled, the section also influences the supports. |

### *13.1.4.4 Colors*

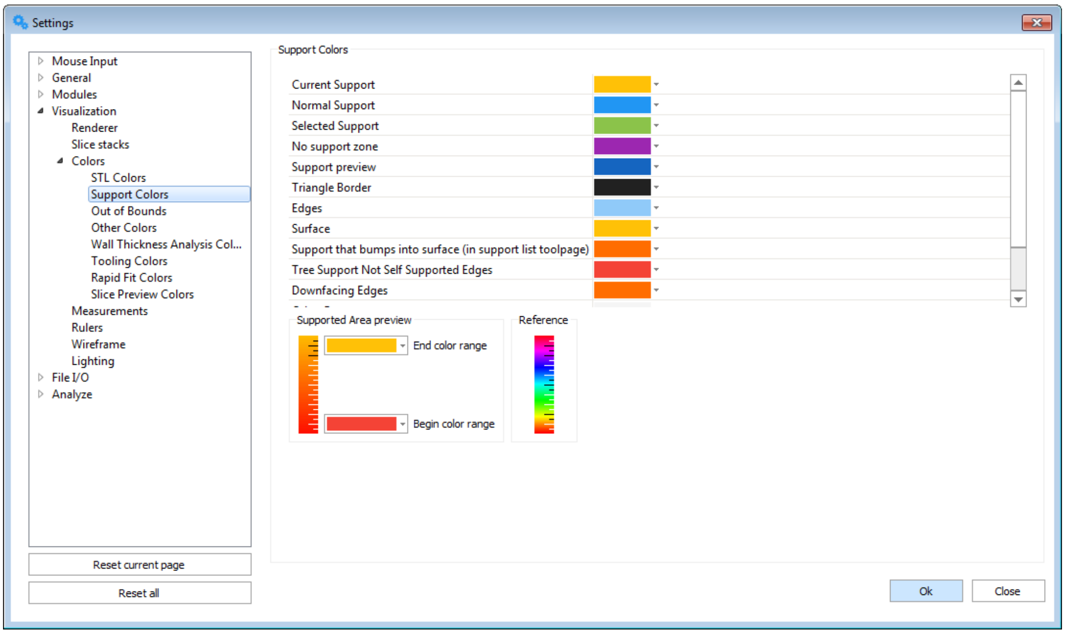
#### 13.1.4.4.1 STL Colors



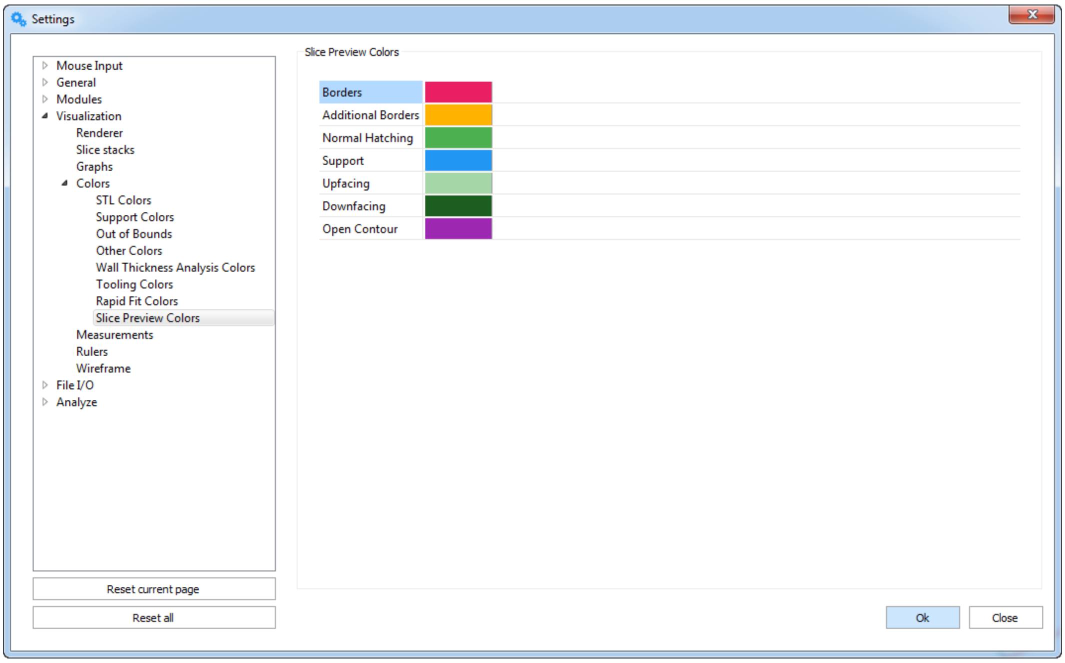

When you select random colors, random colors are used for the different parts you import. When you select Preset colors, the colors of this window are used.

| | |
|---|---|
| Part 1 to Part 5 | These five buttons represent the five colors as they will be assigned to the loaded parts. The first part you load will get the first color. The second part will get the second color and so on. |
| Flipped Triangles | The color of the flipped triangles. |
| Bad Edges | The color of the bad edges. |
| Triangle Border | The color of the triangle borders. |
| Wireframe | The color of the wireframe. |
| Marked Triangles | The color of the marked triangles. |
| Marked Triangles' Borders | The color of the marked triangles' borders. |
| Marked Borders' Thickness | The color of the marked borders' thickness. |
| Marked Textures' Borders | The color of the marked textures' borders. |
| Marked Textures' Thickness | The color of the marked textures' thickness. |
| Allow Autocolor reset painting | When checked, Autocolor is allowed to reset painting. |

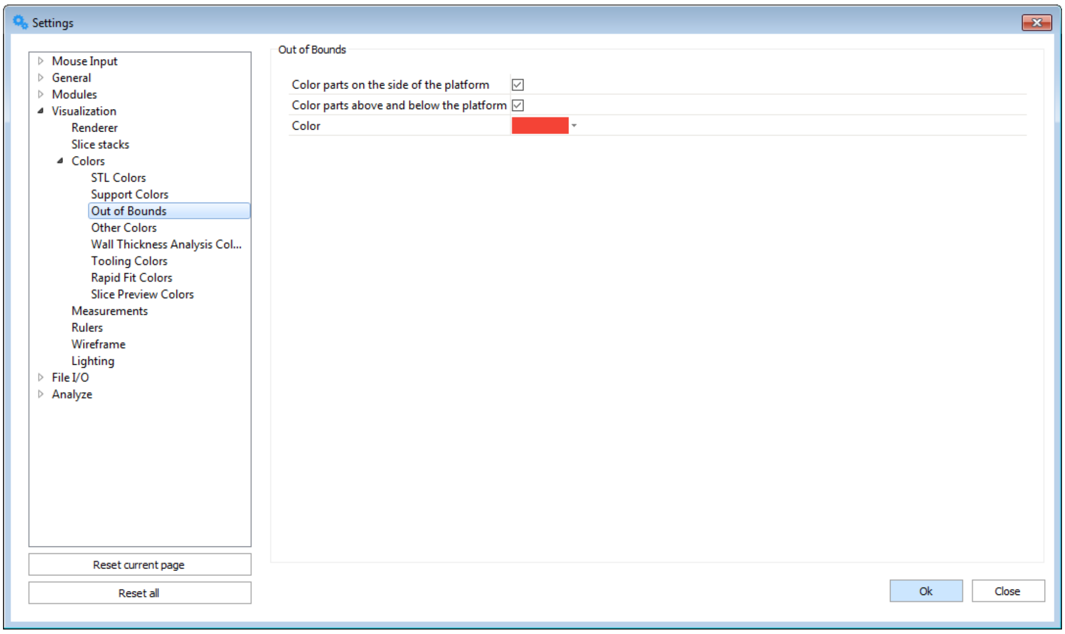
### 13.1.4.4.2 Support Colors




### 13.1.4.4.3 Slice Preview Colors

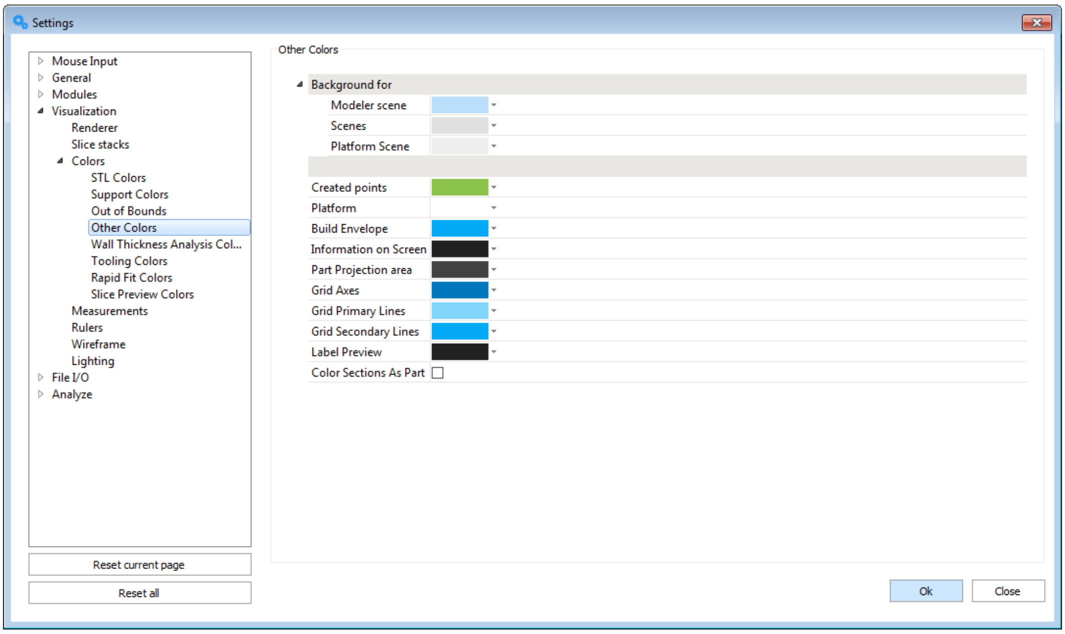


### 13.1.4.4.4 Out of bounds Colors




| | |
|---|---|
| Color parts on the side of the platform | When activated the parts that exceed the bounds of the platform are colored. |
| Color parts above and below the platform | When activated, the parts that exceed the bounds of the platform above and below are colored. |
| Color | Specify the color of the parts that are out of bounds |

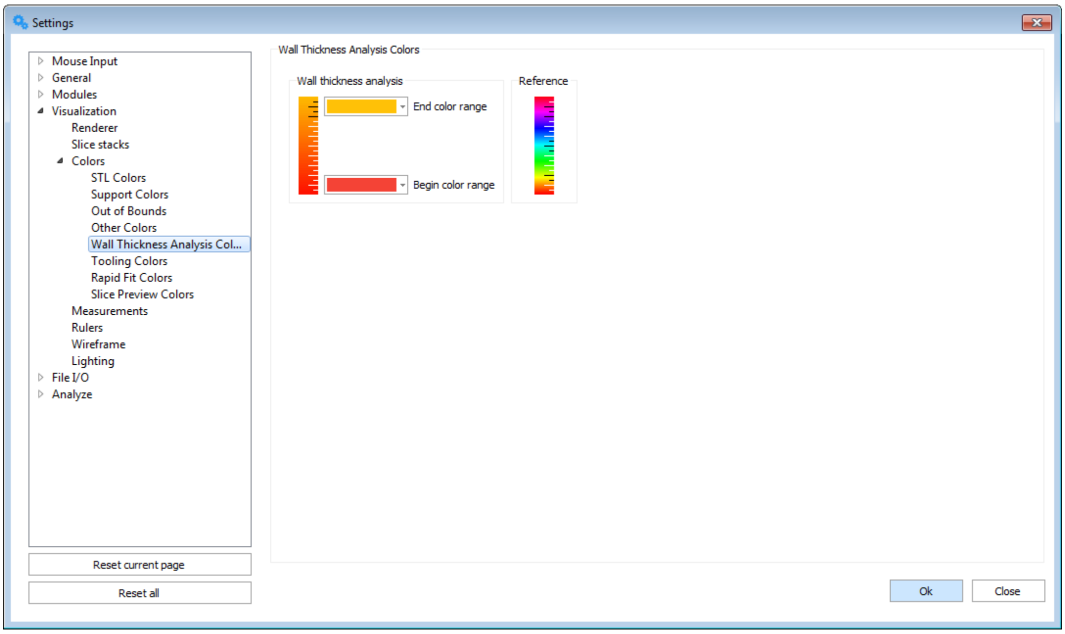
### 13.1.4.4.5 Other Colors



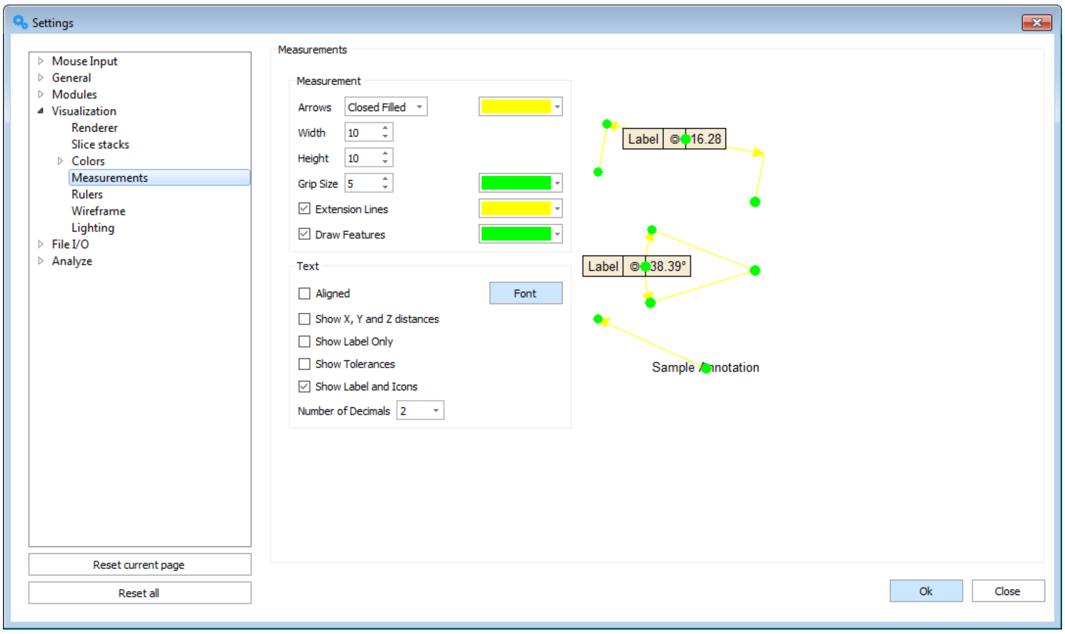

The user can define the colors of the background for the Modeler scene, the Annotation Scenes and the Platform Scenes. Furthermore, he can choose the color of measurement lines, created points, the build envelope and the grid.

The user can choose to have sections colored as part.

### 13.1.4.4.6 Wall Thickness Analysis Colors



## *13.1.4.5 Measurements*



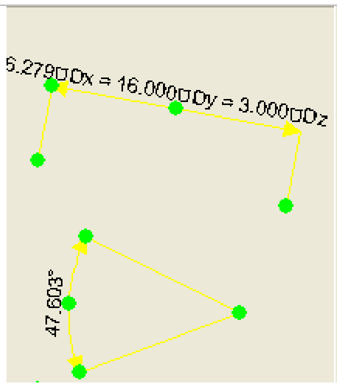
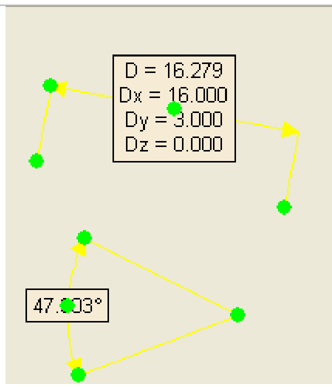
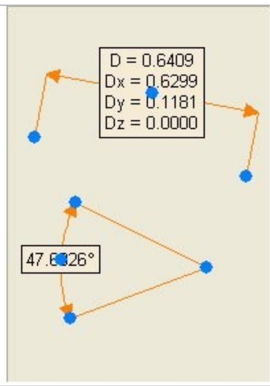
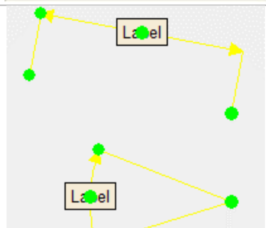

### 13.1.4.5.1 Measurement

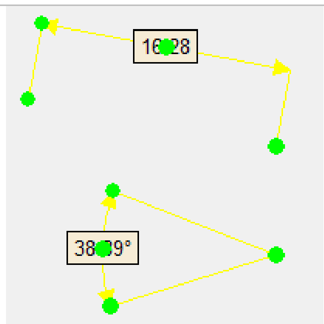
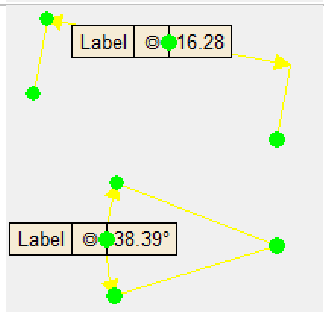
| | |
|---|---|
| Arrows | Arrows can be placed at the end of the line that indicates the distance between two features. An open, a closed, or a closed filled arrow can be chosen. |
| | The color of the arrows can be adapted. |
| Width | The width of the arrows can be adapted. |
| Height | The height of the arrows can be adapted. |

### 13.1.4.5.2 Extension Lines

| | |
|---|---|
| Extension Lines | You can choose to draw extension lines or not. |
| | You can adapt the color of the extension lines. |

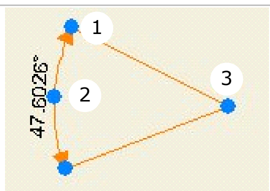
### 13.1.4.5.3 Text

| | | |
|---|---|---|
| Aligned | Checked |  |
| | Not Checked |  |
| Font | You can adapt the font of the text. | |
| Show X, Y and Z distances | Checked, the measurement value is not aligned. |  |
| Show Label Only | Only show labels |  |

| | | |
|---|---|---|
| Show Tolerances | Show Tolerances |  |
| Show Label and Icons | |  |
| | | |

### 13.1.4.5.4 Grips

When you select a measurement, some grips (rounds) will appear on the measurements lines. They allow changing the position of the measurement lines. The grip (1 in the figure) on the intersection of the line that indicates the length and an extension line allows you to turn the former around the axis between the features. The grip (2 in the figure) in the middle of the line that indicates the length allows you to extend or shorten the extension lines. The grips (3 in the figure) that mark the feature (in the case shown below it is a point), can be dragged to the same feature (in this case a point), positioned somewhere else on the part. The measurement value will be adapted.

| | |
|---|---|
| Size | You can define the size of the grip. |
|  | You can define the color of the grip. |
|  | |

### 13.1.4.5.5 Features

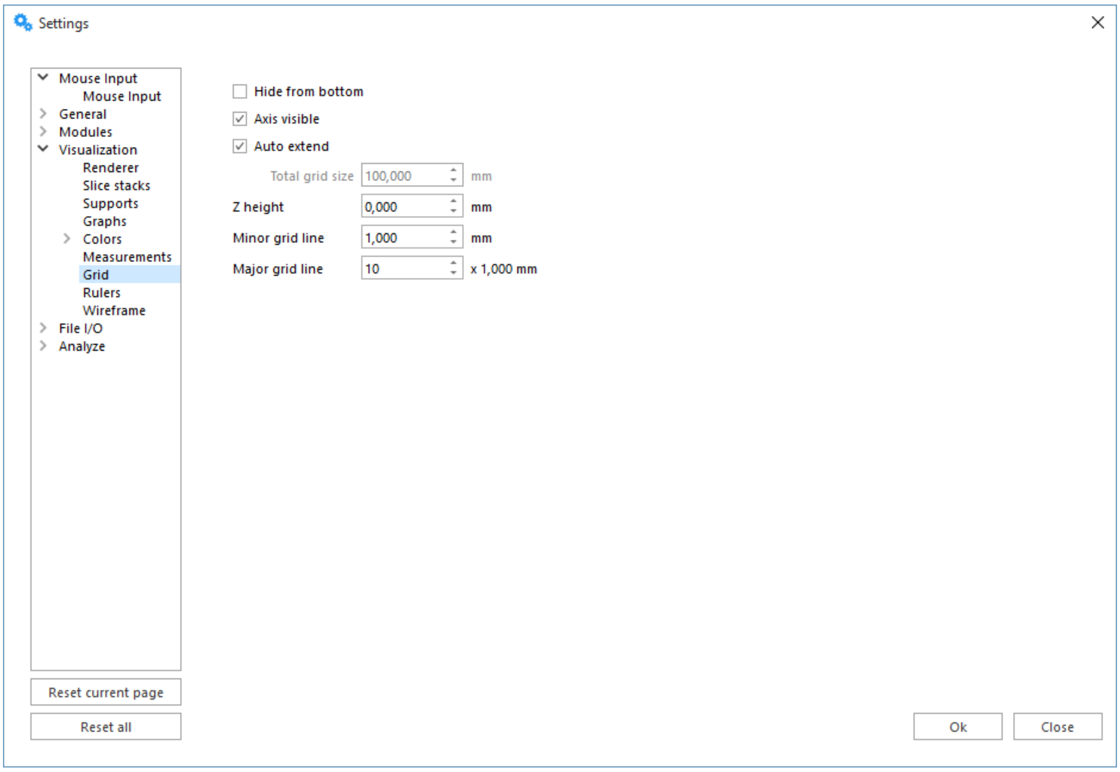
| | |
|---|---|
| Draw Features | A point is indicated with a cross, a line and a circle will be colored in the selected color, the axes of a cylinder will be drawn and the contours of its two discs will be colored in the indicated color, a sphere will be marked with three circumpolar circles. |

| | |
|---|---|
| | You can define the color of the features. |

#### 13.1.4.5.6 Decimal places

| | |
|---|---|
| Number of decimal places | Specify the amount of decimal to take into account. |

### *13.1.4.6 Grid*

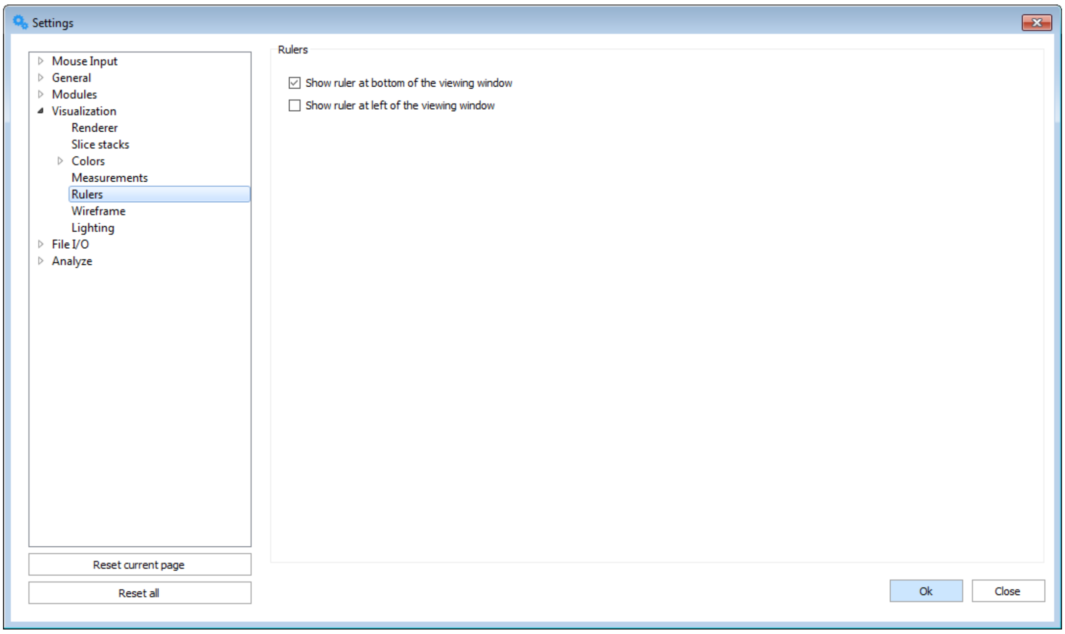



| | |
|---|---|
| Hide from bottom | The grid will be hidden when rotating the view below the XY plane. |
| Axis Visible | The axes form the intersection of the grid with the XZ an YZ planes through the origin. By default they are part of the major and minor grid. To see these axes, you can check this box. The axes will turn light blue. |
| Auto Extend | When this box is checked, the grid will be adapted depending on the Z projection of the loaded parts. |
| Total Grid Size | Here you can set the total grid size. |
| Z height | You can put the grid at a certain height under or above the XY plane. |
| Minor grid line | You can define the grid size here. The minor grid is colored light gray. |

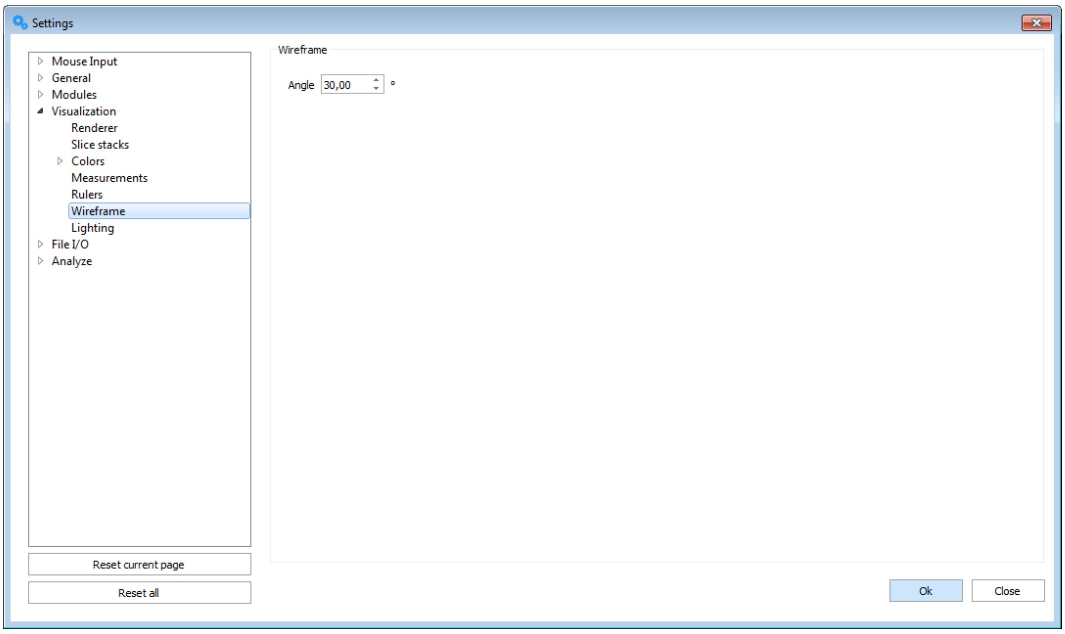
| | |
|---|---|
| Major grid line | If you would like to have a second less detailed grid, you can fill in a number n here. The lines of the major grid will lie n times the lines of the minor grid. The major grid is colored dark grey. |

### *13.1.4.7 Rulers*

The rulers can be placed at the bottom of the working area and/or in the left side of the working area.

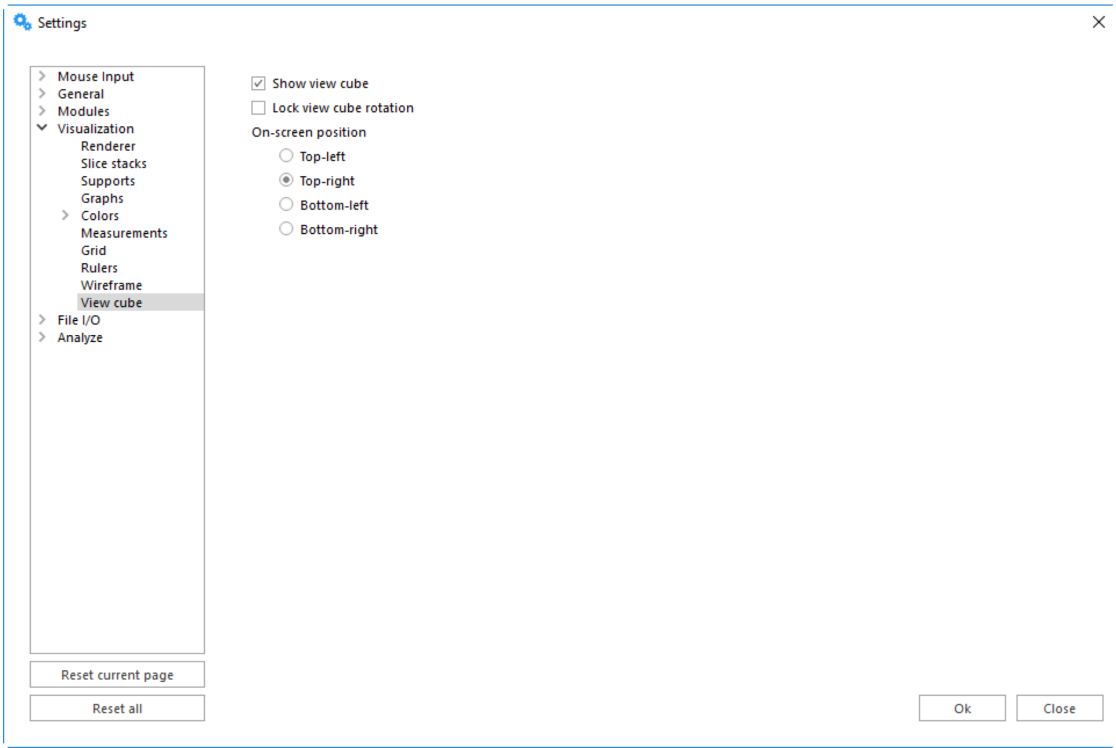


### 13.1.4.8 Wireframe




| | |
|---|---|
| Angle | A line of the wireframe is drawn when the angle between 2 triangles is exceeding a certain value. The default value is 30°. Here, you can adjust this value. |

### 13.1.4.9 View cube

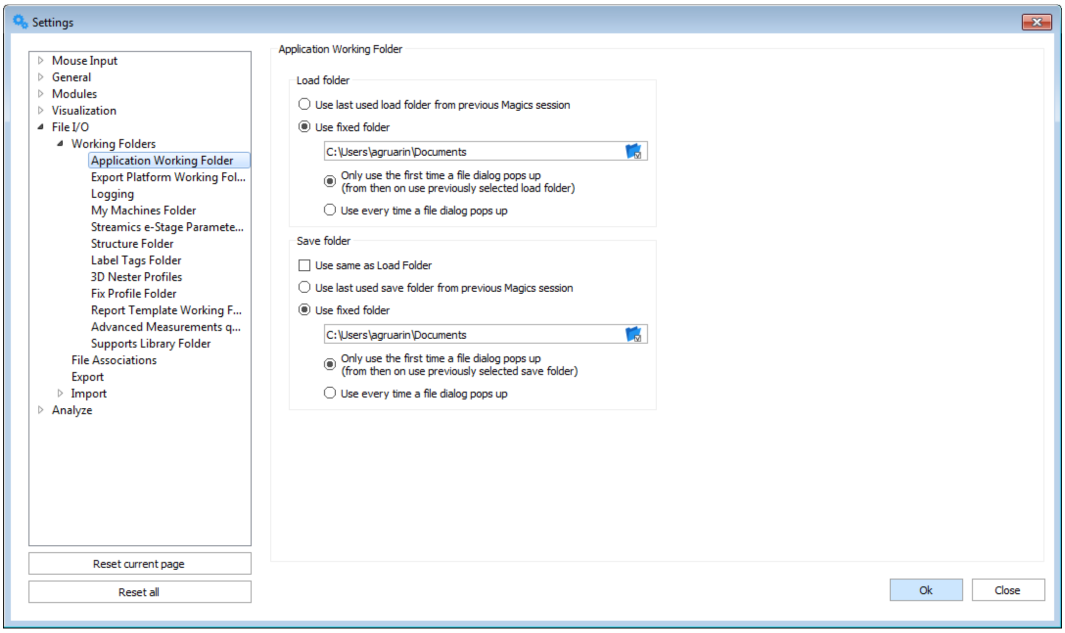


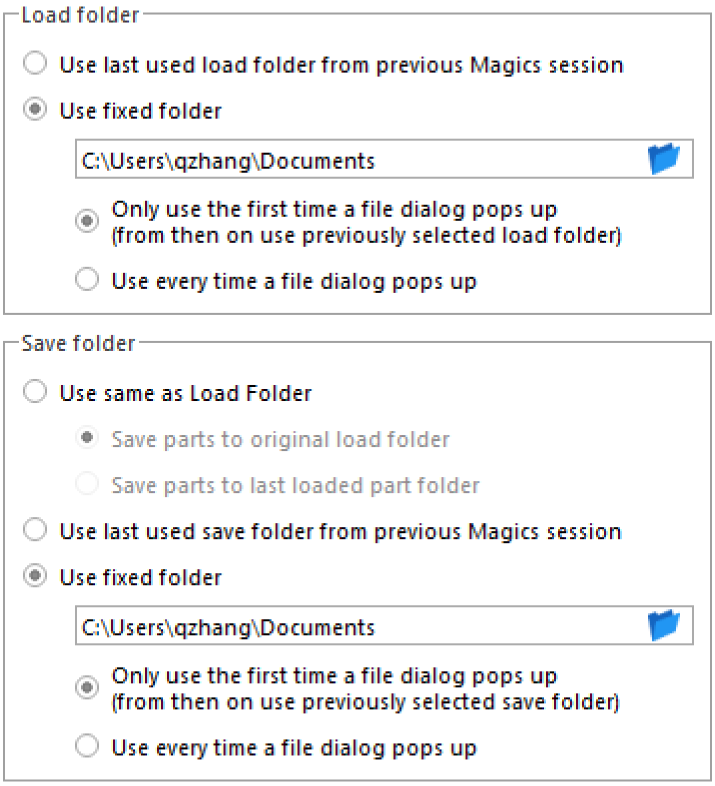
| | |
|---|---|
| Show view cube | Toggle the visibility of the view cube on the scene. |
| Lock view cube rotation | When selected, the view cube will not be linked anymore to the rotation of the viewport, and it will always remain in the default ISO view front-left-top. |
| On screen position | Select the preferred corner of the scene to position the view cube. By default, it's positioned in the bottom-right corner. |

### 13.1.5 File I/O

#### *13.1.5.1 Working Folders*

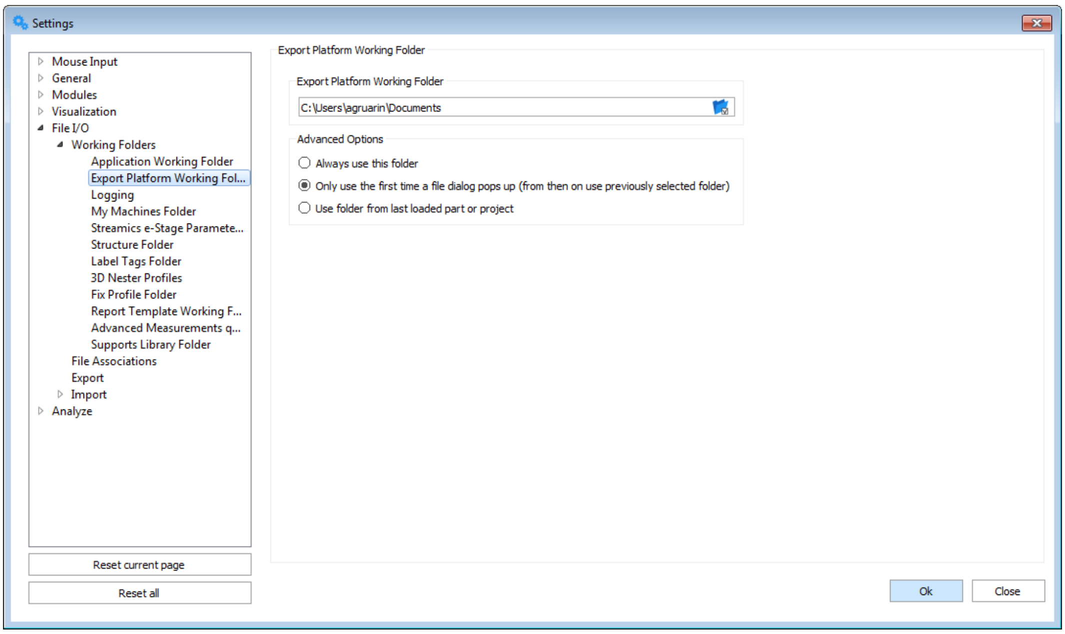
##### 13.1.5.1.1 Application Working Folders






| | |
|---|---|
|  | You can browse by clicking on the folder and set a folder as default folder. |

### 13.1.5.1.2 Export Platform Working folder

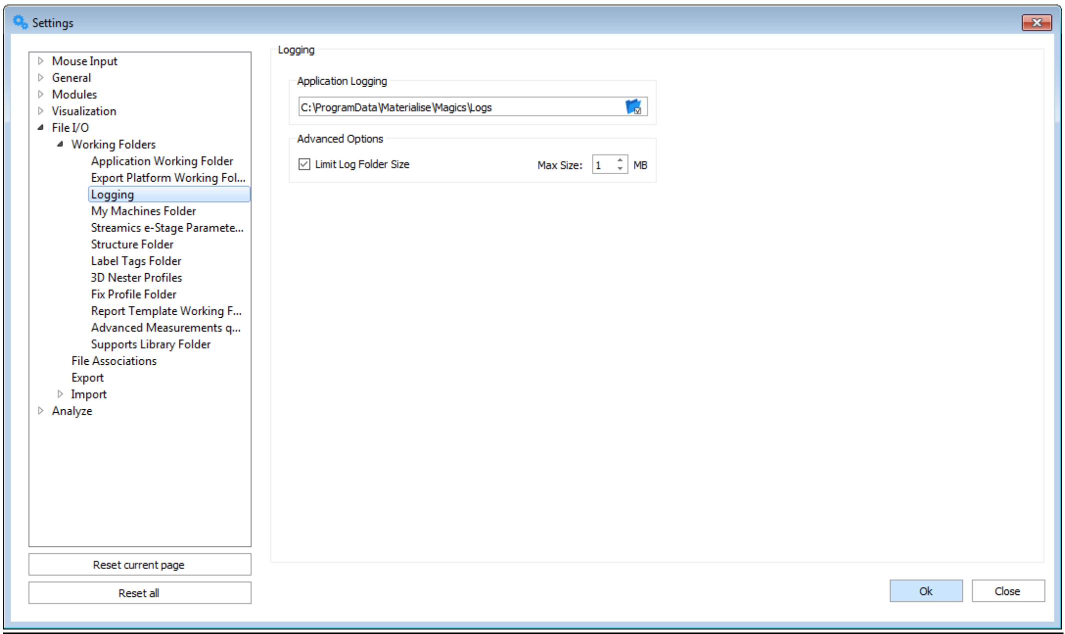


| | |
|---|---|
|  | You can browse by clicking on the folder and set a folder as default folder. |

#### 13.1.5.1.2.1 Advanced Options

| | |
|---|---|
| Option 1 | Magics always proposes this folder when a part needs to be loaded or saved. |
| Option 2 | Magics only proposes the chosen folder the first time a file dialog pops up. The succeeding times a file dialog pops up, the previously selected folder is used. |

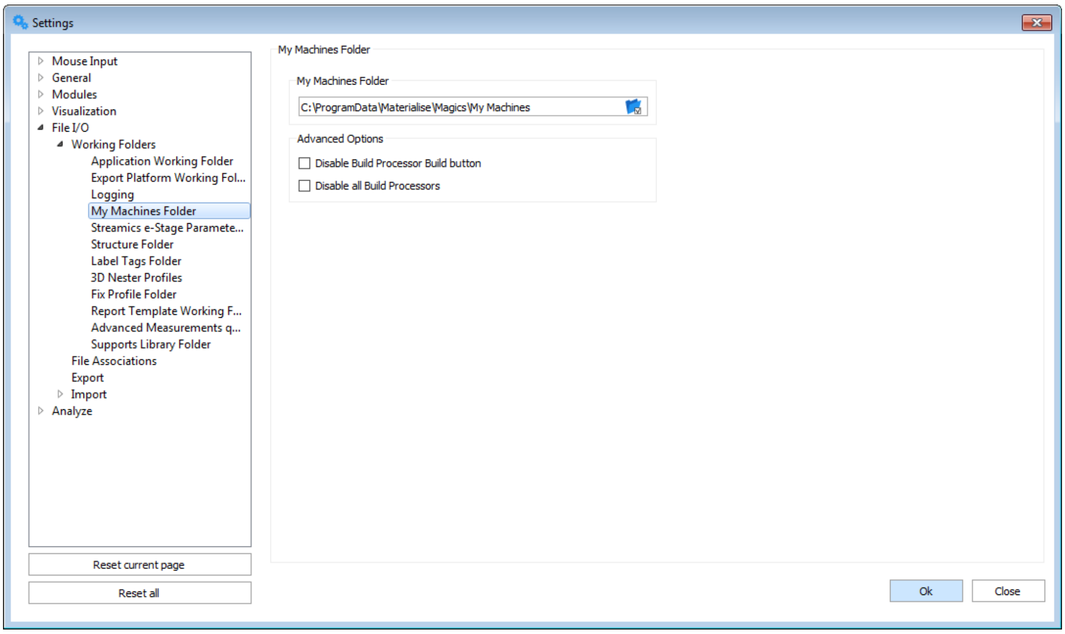
### 13.1.5.1.3 Logging




Magics keeps a log file. In this file all performed operations and actions are written.

| | |
|---|---|
|  | Here you can define where you would like to save the log file. |
| Limit Log Folder Size | You can define the maximum size for the log folder or not. |
| Max Size | Set the maximum size for the log folder. If the size is reached, the first actions of the Magics session will be erased, so that the latest actions can be written in the file. |

### 13.1.5.1.4 My Machines Folder

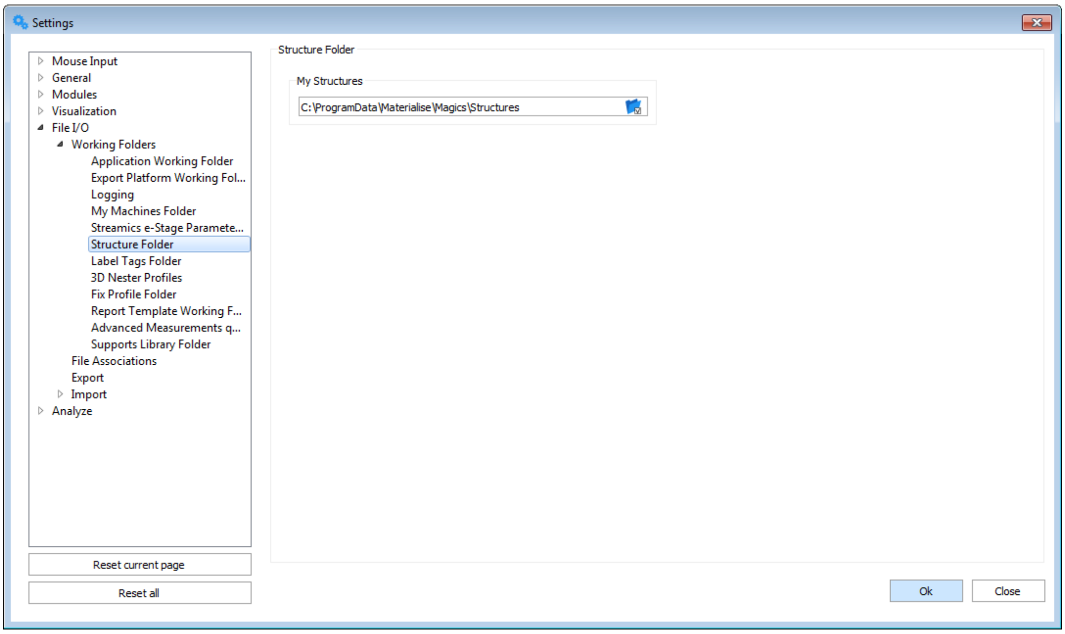



| | |
|---|---|
|  | Here you can define my machines folder. The My Machines Folder contains the machine files that are used by the user. (Machine Setup) |

#### 13.1.5.1.4.1 Advanced Options

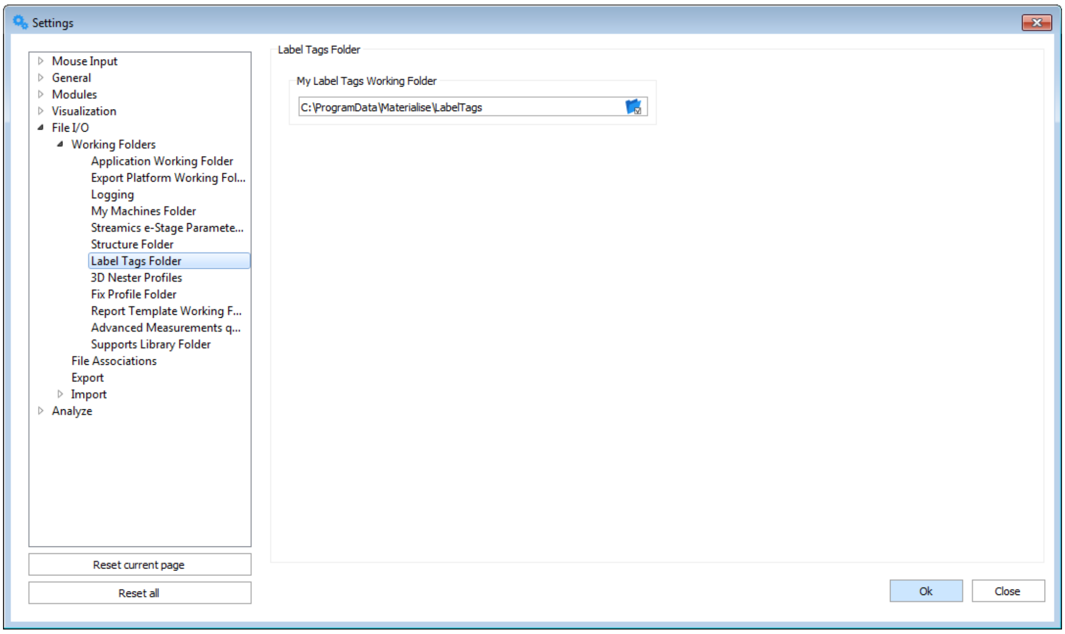
| | |
|---|---|
| Disable Build Processor Build Button | Disable the Build Processor Build button. |
| Disable all Build Processors | No longer use any of the defined build processors. |

### 13.1.5.1.5 Structure folder



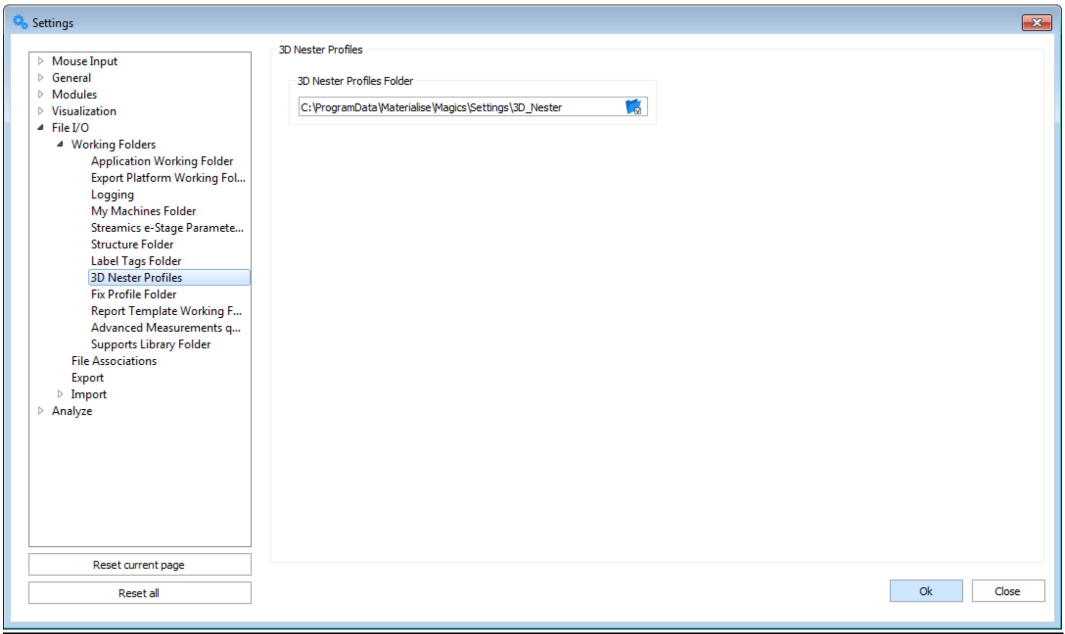

| | |
|---|---|
|  | Here you can define the structure folder. This folder contains all structures with can be used by the user. |

### 13.1.5.1.6 Label Tags folder



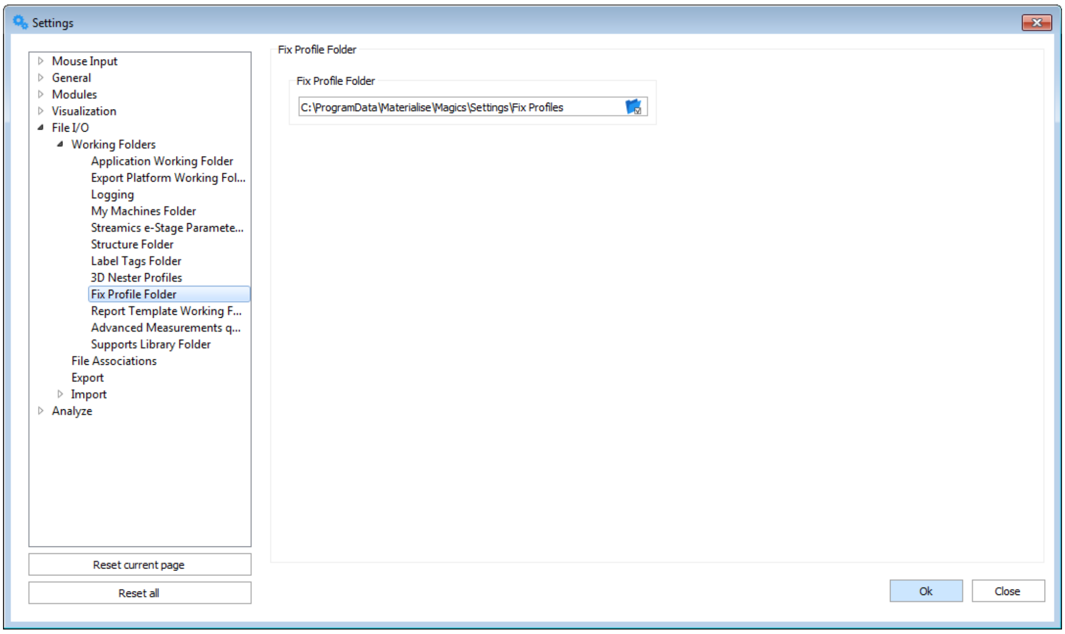

| | |
|---|---|
|  | Here you can define the label tag folder. This folder contains all label tags which can be used by the user. |

### 13.1.5.1.7 3D Nester Profile



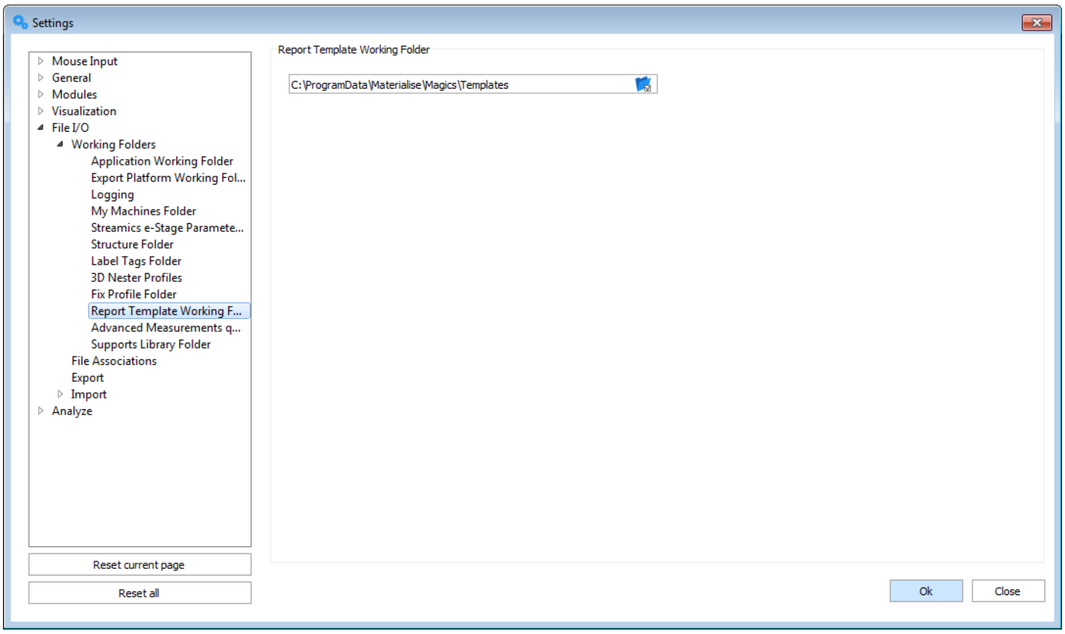

| | |
|---|---|
|  | Here you can define the 3D Nester profile folder. This folder contains all 3D nester profiles which can be used by the user. |

### 13.1.5.1.8 Fix Profile Folder



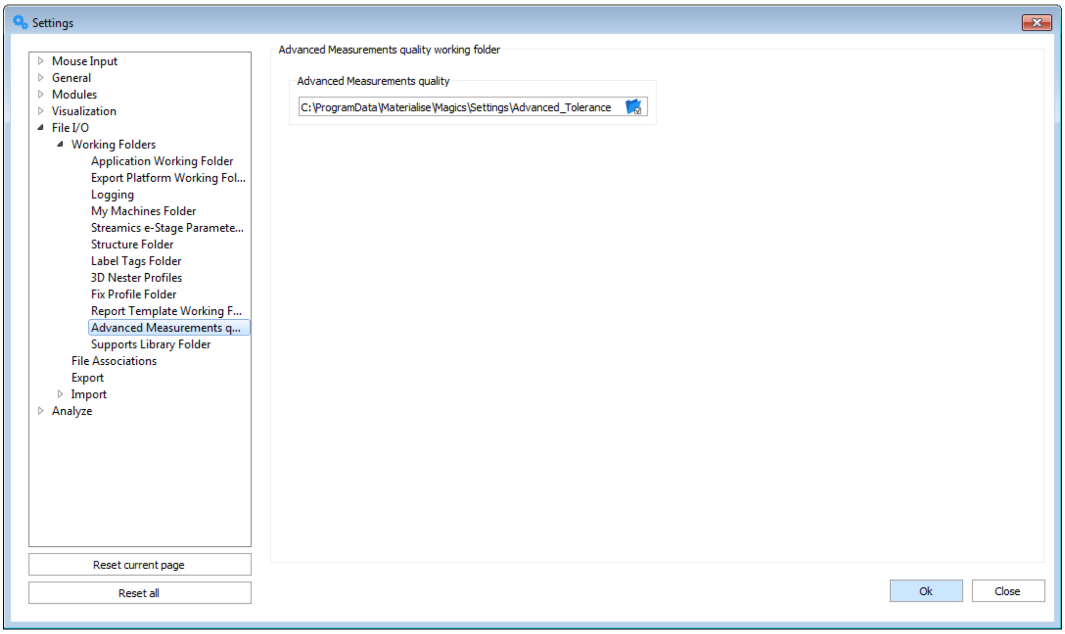
| | |
|---|---|
|  | Here you can define the Fix Profile Folder. The Fix Profile Folder contains the fix profile that is used by the user. |

### 13.1.5.1.9 Report Template Working Folder



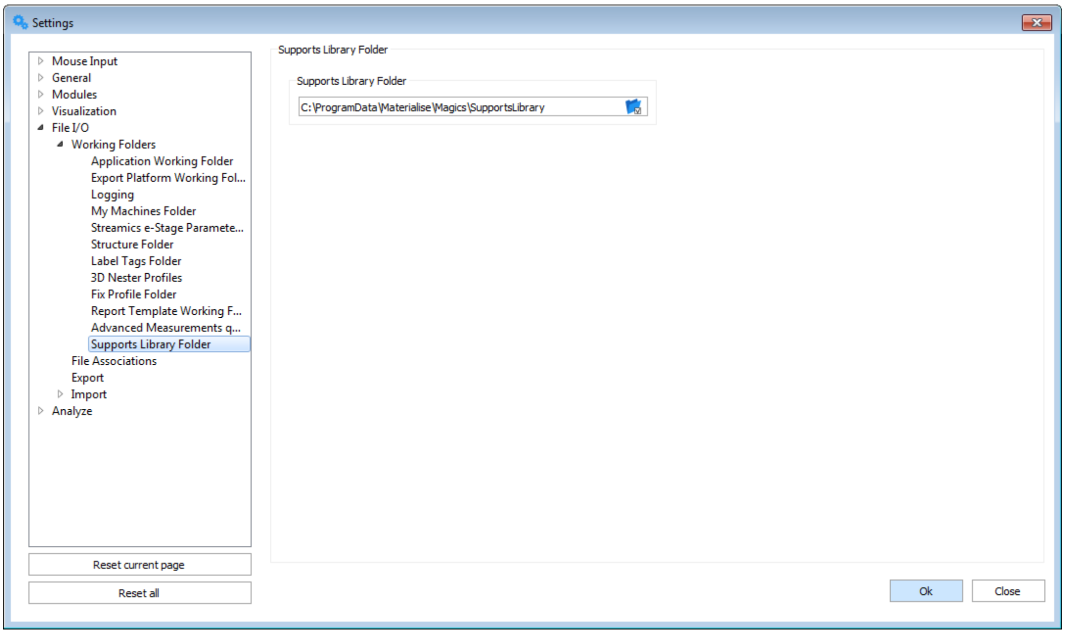

| | |
|---|---|
|  | Here you can define the Report Template Folder. The Report Template Folder contains the templates that are used by the user. |

### 13.1.5.1.10 Advanced measurements quality



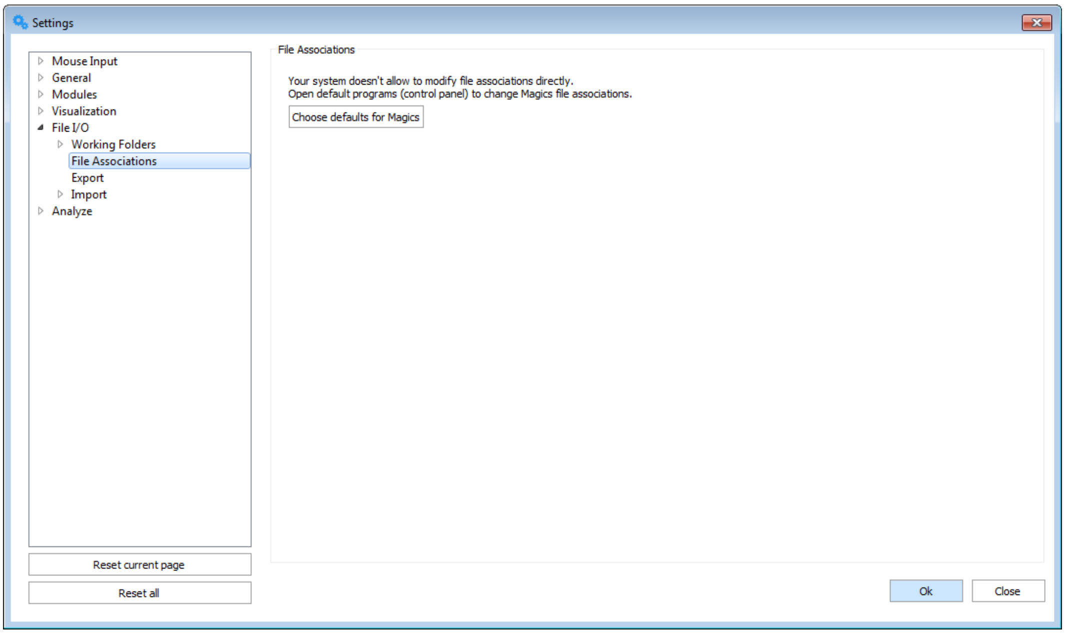

| | |
|---|---|
|  | Here you can define the advanced measurement folder. The advanced quality folder contains the quality documents that are used by the user. |

### 13.1.5.1.11 Support Library Folder

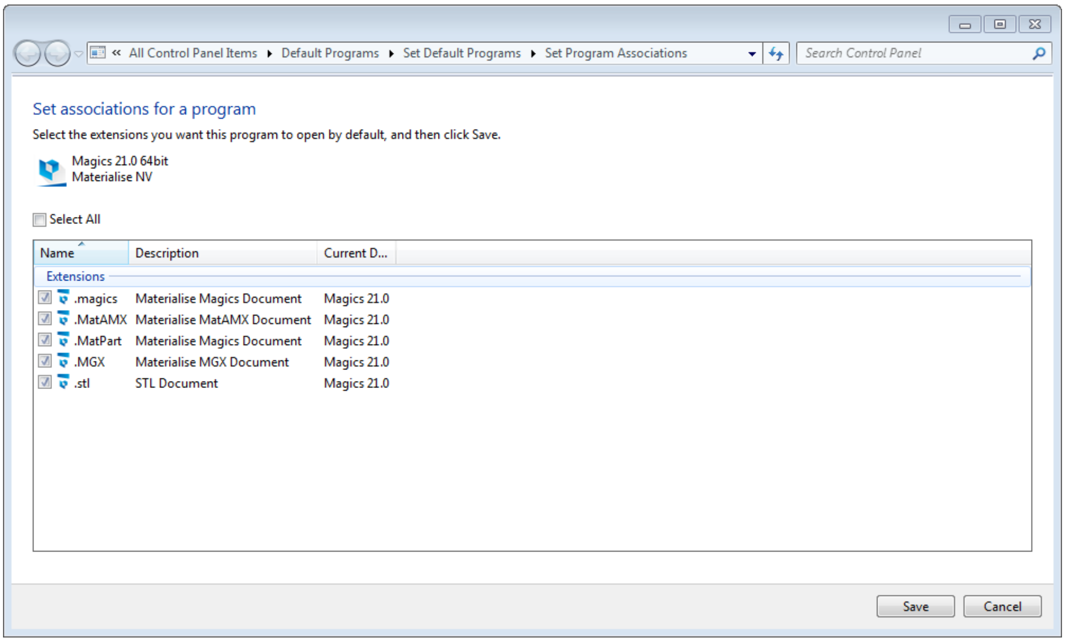


| | |
|---|---|
|  | Specify in which folder your support parameter settings will be stored |

### 13.1.5.2 File Associations

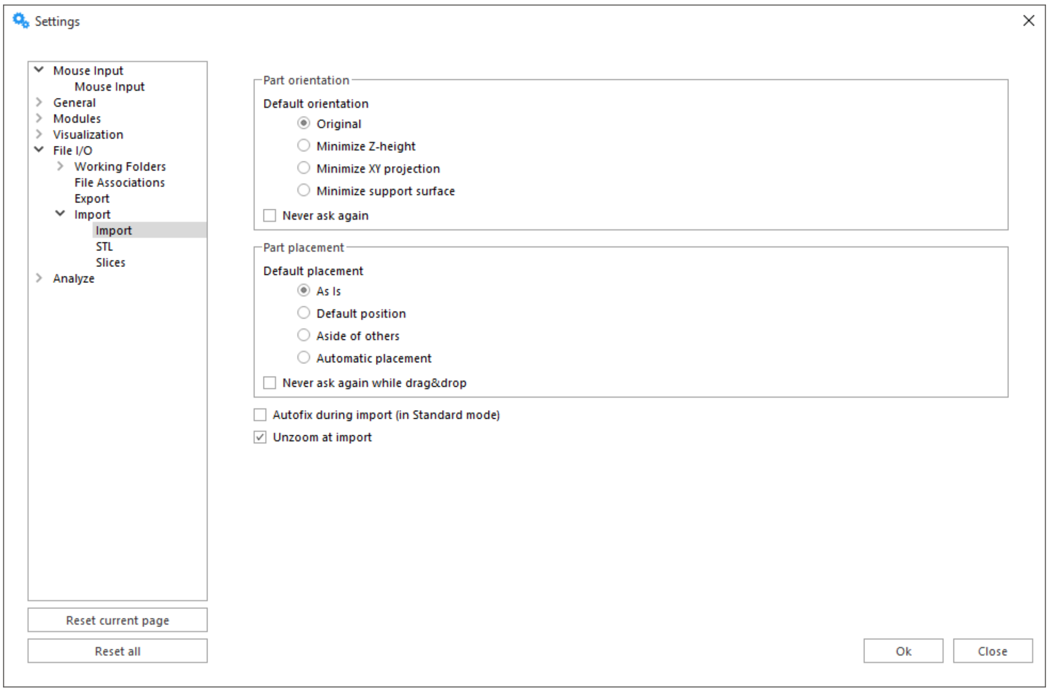



Click ***Choose Defaults for Magics*** to go to the default Windows File Associations menu.



### *13.1.5.3 Import*

#### 13.1.5.3.1 Import

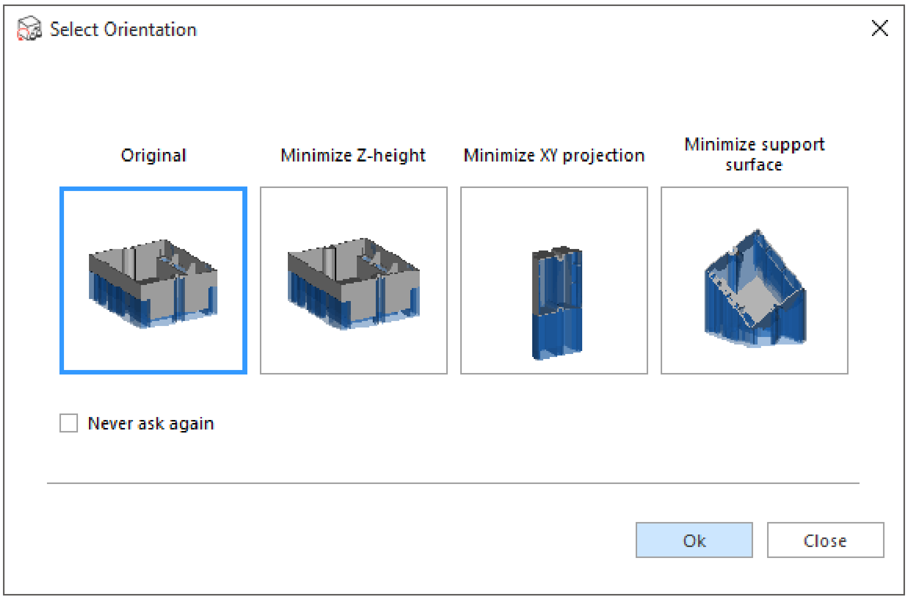



Within this window you can define which part orientation and placement option you want to use as the default one, and whether you want to automatically fix your part upon importing.

Part orientation

| | |
|---|---|
| Original | The original orientation of the part will be used. |
| Minimize Z-height | The part will be rotated so the Z-height is minimized. |
| Minimize XY projection | The part will be rotated so the XY projection is minimized. |
| Minimize support surface | The part will be rotated so the support surface is minimized. This option is only available with a Support Generation license. |
| Never ask again | The selected option will be used without prompting the user to choose an orientation. |

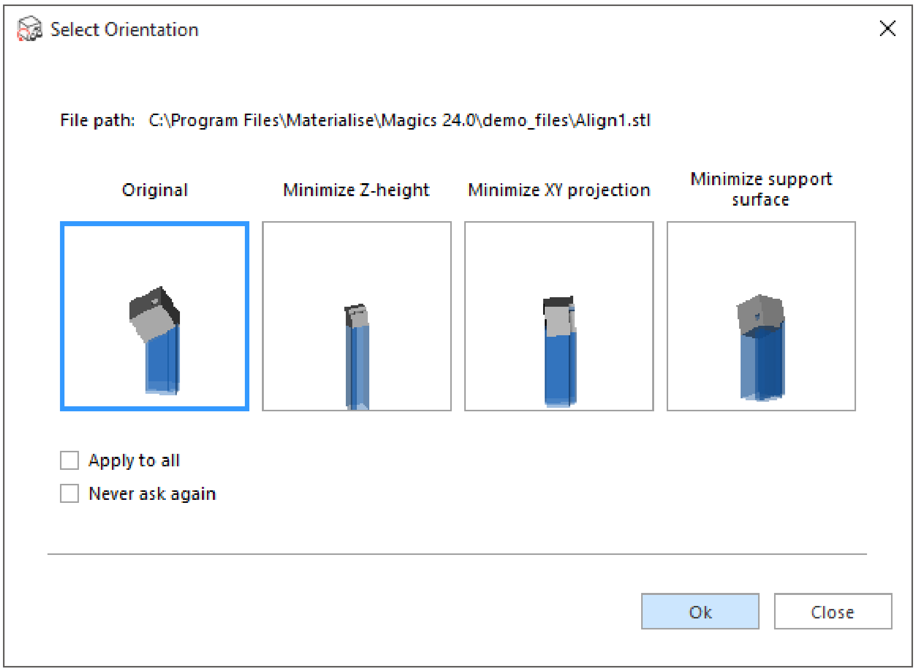
When importing a part, the following dialog will be shown (unless “Never ask again” is enabled):




Select the desired orientation by clicking on the preview, then clicking “Ok”.

If “Never ask again” is enabled, the selected option will be remembered as the default one.

When importing multiple parts at once, the dialog will appear for each part:




The “File path” can help you identify which part exactly is being imported.

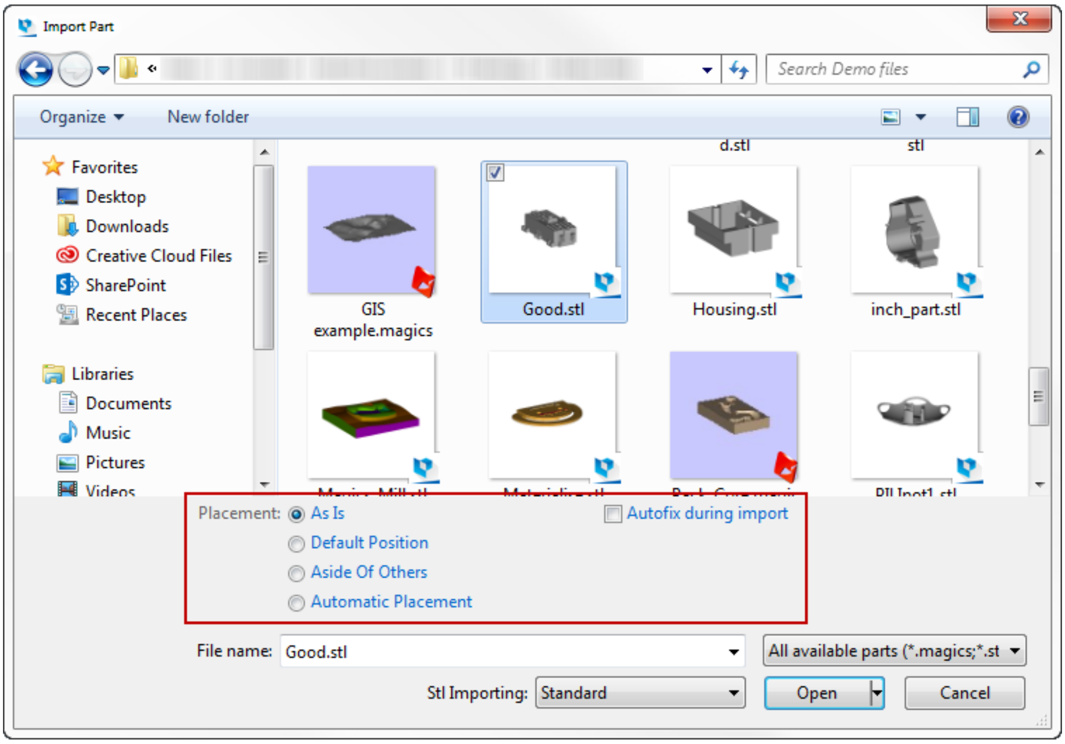
By checking “Apply to all”, the selected orientation will be applied to all parts that are being imported at once.

Part placement

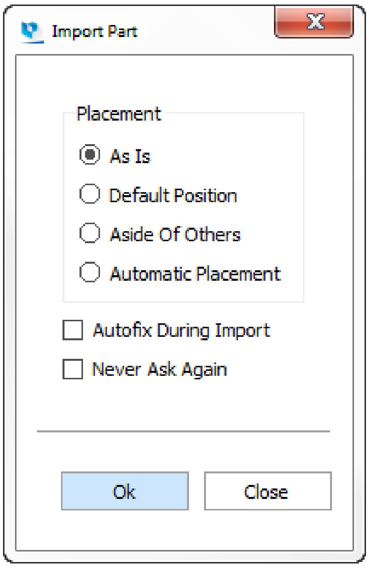
| | |
|---|---|
| As Is | The part will be placed on the same position it was saved in. |

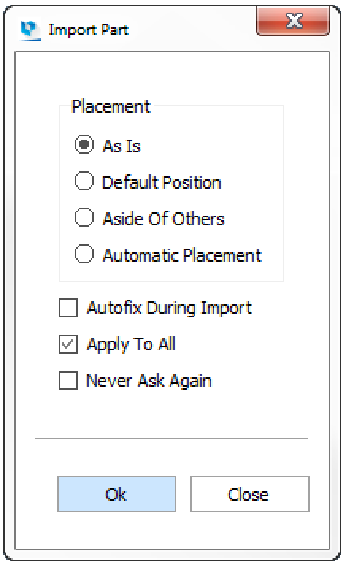
| | |
|---|---|
| Default Position | The part will be placed on the default (platform) position. |
| Aside of others | The part will be placed next to already loaded parts. |
| Automatic Placement | The part will be placed according to the Automatic Placement method defined in the machine file. Parts that are already on the platform will not move, but will be taken into account while placing the newly imported parts. |
| Autofix during import (in Standard mode) | The imported part will be fixed automatically if it is loaded in Standard Memory mode. |
| Never ask again while drag & drop | If disabled, a dialog will pop up when dropping a file into Magics, so the user can still define placement and fixing settings.<br><br>If enabled, no dialog will be shown, and the defined settings will be used. |
| Unzoom at import | After importing the file, the view will change to focus on the part. |

When using the dialog to import a file, these options can still be overruled here:




When dropping one or multiple files into Magics, the following dialog will appear:

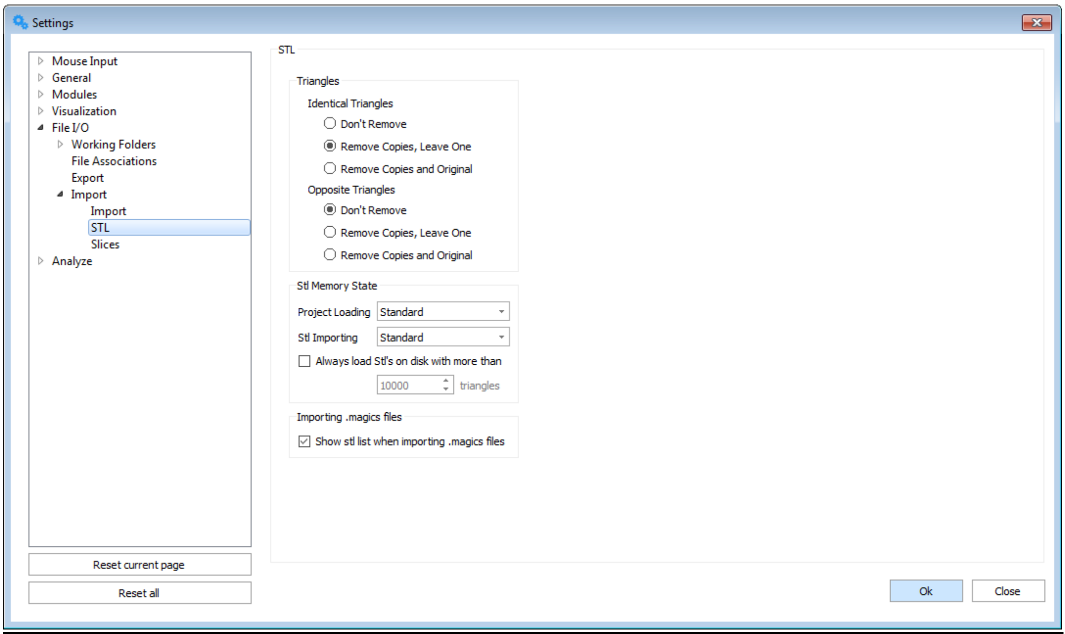



When "Apply to all" is enabled, Magics will use the same settings for all parts that were dropped into Magics together. When disabled, a new window will appear for each imported part.

| | |
|---|---|
| Fixing & view optionsAutofix during import (in Standard mode) | The imported part will be fixed automatically if it is loaded in Standard Memory mode. |
| Unzoom at import | After importing the file, the view will change to focus on the part. |

### 13.1.5.3.2 STL



#### 13.1.5.3.2.1 Identical Triangles

| | |
|---|---|
| Identical Triangles | Identical triangles have their normals in the same direction. You can choose to leave these triangles, leave one of the two triangles or remove them both. |
| Opposite Triangles | Opposite Triangles have their normals in opposite directions. You can choose to leave these triangles, leave one of the two triangles or remove them both. |

#### 13.1.5.3.2.2 STL Memory State

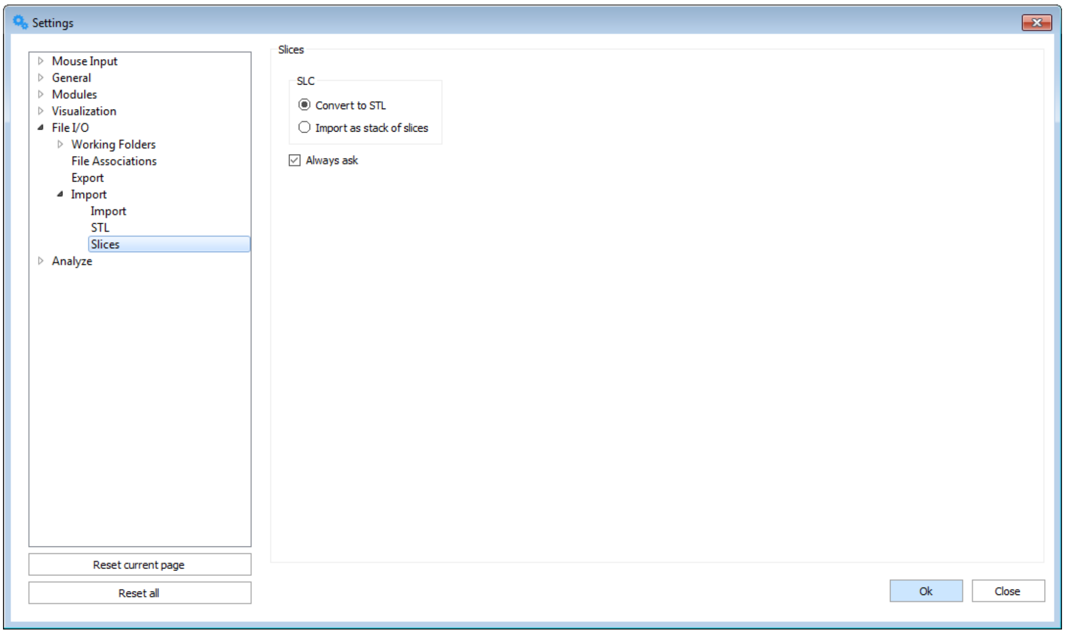
| | | |
|---|---|---|
| .magics Project Loading | You can define in which memory state you want to load a project. This memory state becomes the default when importing a project. | |
| | Standard | This is the standard memory state of a STL file. Magics knows the placement of the triangles and their mutual dependencies. The user is able to perform actions on STL level (E.g. deleting triangles). |
| | Compact | The STL resides in the memory as read-only, therefore it uses far less memory than the Standard memory state. Magics does not know the placement of the triangles nor their mutual dependencies. The user is not able to perform actions on STL level. |
| | On Disk | The STL is saved on disk and unloaded from the memory. The STL will stay in the project but the user cannot perform any actions on it. |
| | As Saved | The Project will be loaded as previously saved. |
| STL Importing | You can define in which memory state you want to load a project. This memory state becomes the default when importing a project. | |
| | Standard | This is the standard memory state of an STL file. Magics knows the placement of the triangles and their mutual dependencies. The user is able to perform actions on STL level (E.g. deleting triangles). |

| | | |
|---|---|---|
| | Compact | The STL resides in the memory as read-only, therefore it uses far less memory than the Standard memory state. Magics does not know the placement of the triangles nor their mutual dependencies. The user is not able to perform actions on STL level. |
| | On Disk | The STL is saved on disk and unloaded from the memory. The STL will stay in the project but the user cannot perform any actions on it. |
| Always load STL's on disk | An STL with more triangles than defined by the user, will always be loaded on disk. | |

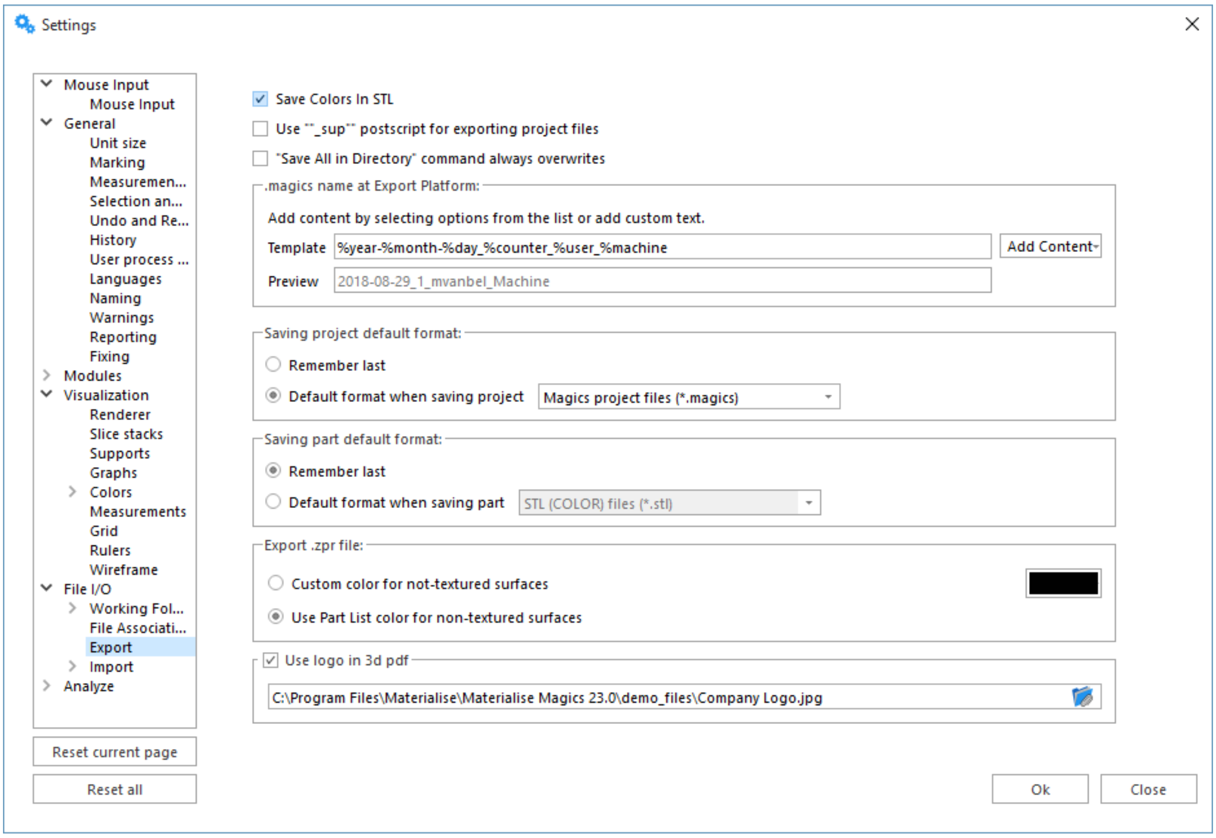
### 13.1.5.3.2.3 STL Memory State

| | |
|---|---|
| Show STL list when importing .magics file | Check this option when you want to see a list of the parts saved in the imported .magics file. In that list you can check the parts you want to be loaded. |

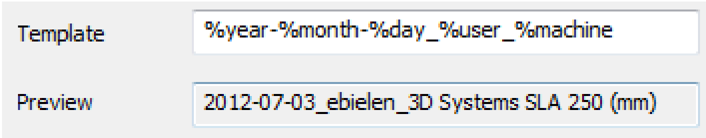
### 13.1.5.3.3 Slices



### 13.1.5.4 Export

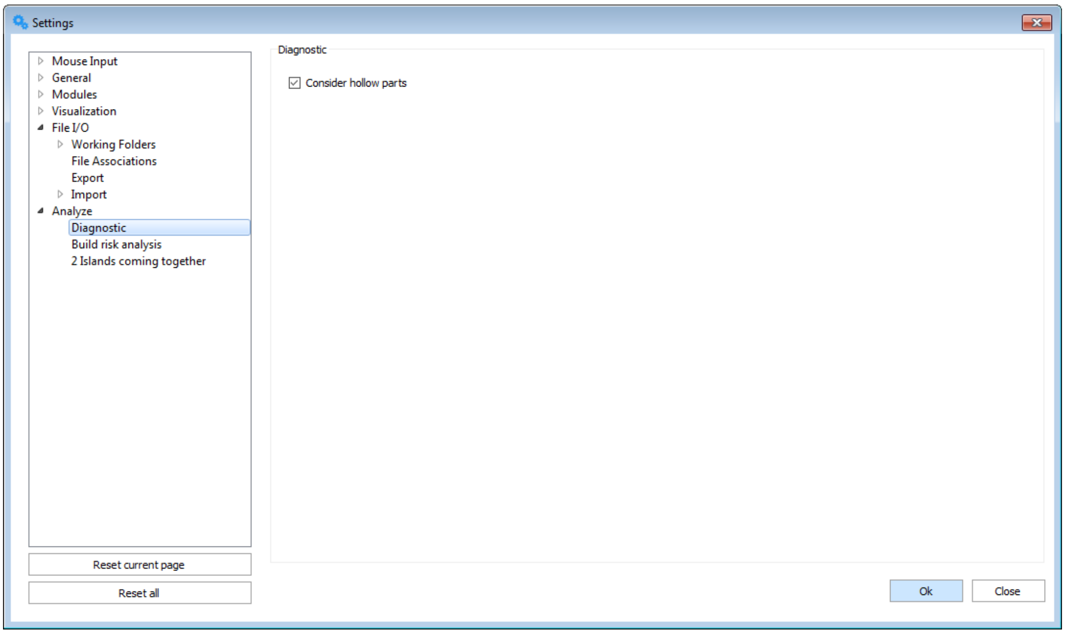



| | | |
|---|---|---|
| Save Colors in STL | When this option is checked, the parts will by default be saved as colored STL (Menu/Tools/Paint Part) | |
| Use _sup postscripts | When the user has created support for a certain file, the extension '_sup' will appear behind the name of the part at the moment the user saves the part. | |
| Save All in Directory | Checking this option will overwrite parts without a warning message. | |
| .magics name at Export platform | | |
| Template | Add the content which has to be displayed in the project name. | |
| Preview | A preview is shown of the naming for .magics files that are created via the export platform functionality | |
| Add Content | | |
| | Year (YYYY) | Actual year the platform is created |
| | Month (MM) | Actual month the platform is created |
| | Day (DD) | Actual day the platform is created |
| | Build counter | Counts the amount of builds per day per platform |
| | User name | Displays the name of the system user who created the platform |

| | | |
|---|---|---|
| | Machine name | The name of the platform that is created |
| | Project name | The name of the Magics platform |
| | Example<br><br>*Remark*: As seen in the example above, additional separation characters can be used. | |
| Saving project default format | | |
| Remember last | The default project saving format will be the last one used. | |
| Default format when saving project | Specify which format will be selected by default when saving a project | |
| Saving part default format | | |
| Remember last | The default part saving format will be the last one used. | |
| Default format when saving part | Specify which format will be selected by default when saving a part | |
| Export .zpr file | | |
| Custom color for non-textured surfaces | Select the color non-textured surfaces should receive when printed | |
| Use Part List color for non-textured surfaces | The printed color of non-textured surfaces will be the part color from the part list, as shown in the scene. | |

## 13.1.6 Analyze

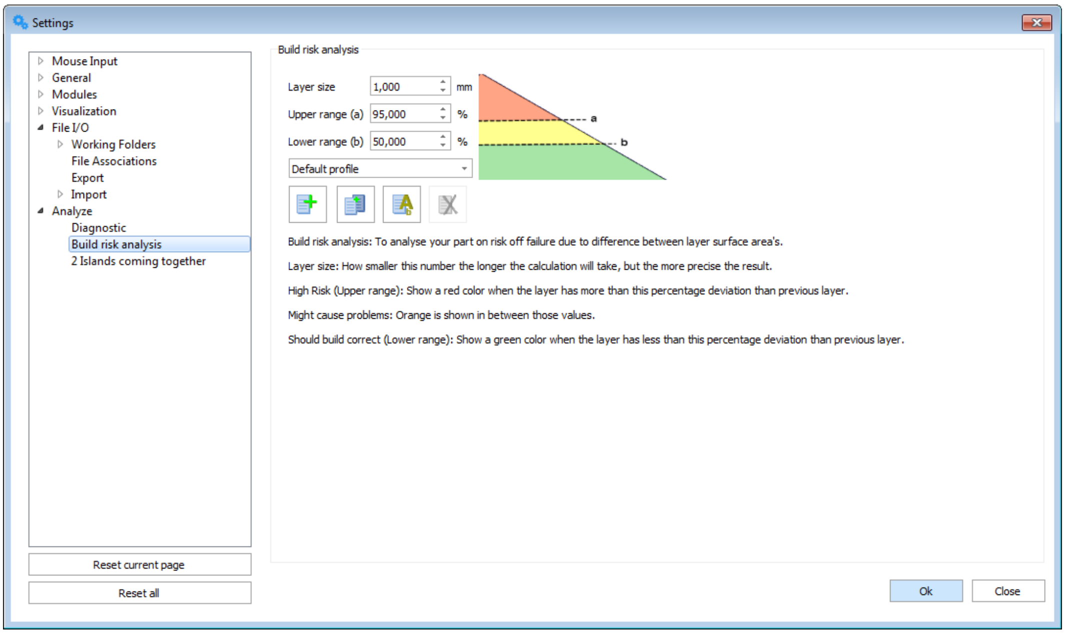
### *13.1.6.1 Diagnostic*




| | |
|---|---|
| Consider hollow parts | During automatic fixing, hollow parts are taken into consideration |

### *13.1.6.2 Build risk analysis*

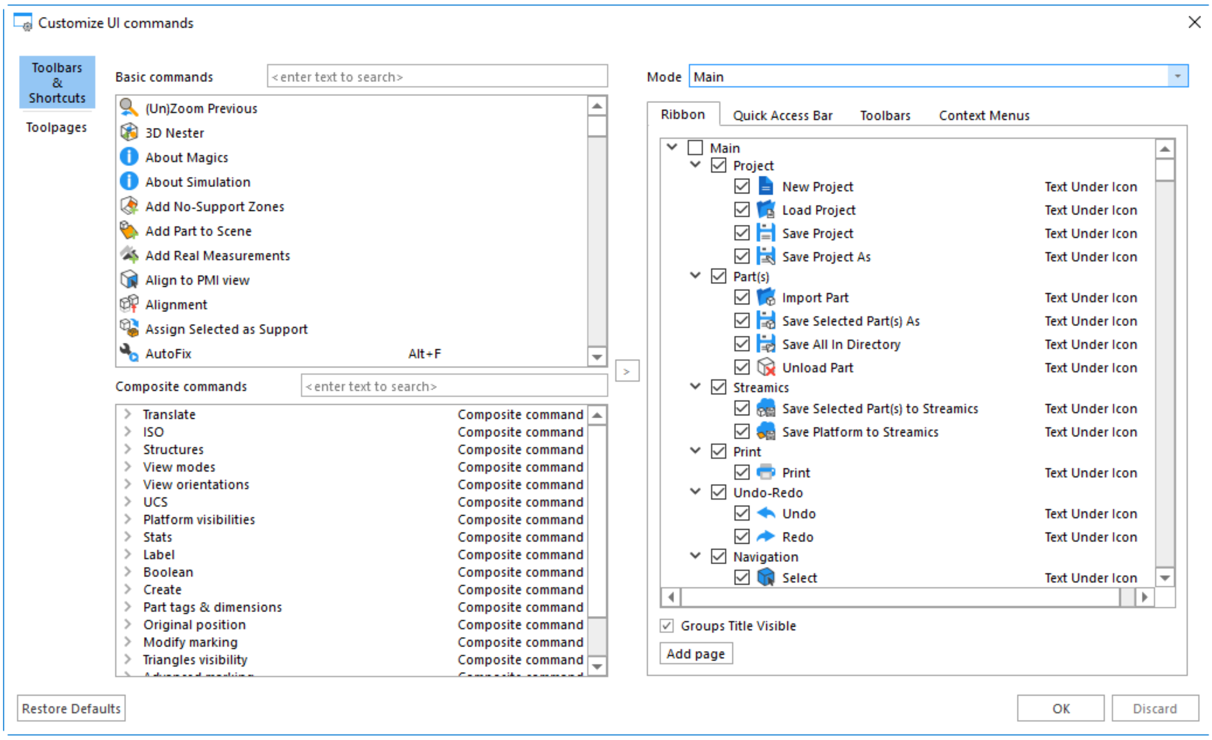
To analyze your part on risk of failure due to defferences between the layer surface areas.




| | |
|---|---|
| Layer size | The smaller the size, the longer the calculation will take, but the more precise the result will be. |
| Upper range (a) (red) | High risk: show a red color when the layer has more deviation than the specified percentage, compared with the previous layer. |
| (orange) | Might cause problems: Orange is shown for deviations that are between the upper and lover range. |
| Lower range (b) (green) | Should build correct: show a green color when the layer has less deviation than the specified percentage, compared with the previous layer. |
| Default profile | Select a previously created custom profile to load or save the settings, or change the default profile. |

## 13.2 Customize UI

In this dialog you can customize the ribbons, quick access bar, toolbars, context menus, toolpages and shortcuts.




*Remark*: If you want to upgrade your settings of previous installed Magics, Magics will load all the toolbars that you have created. But a reset will be performed from the default toolbars, Toolpages and dialog boxes. Keep this in mind! If you customized the main toolbar, you will notice that you have to customize it again as you did before.

— See Chapter 15: Customizations, page 387

## 13.3 Magics Profile

A Magics profile is a profile that contains all user customizable settings in Magics. Each user can have its own Magics profile. These files have the extension *.mpf. It replaces or includes all previous profiles. It should include all user configurations of Magics.

This includes

- GUI settings
- General settings
- RapidFit Files
- Fix profiles
- Report templates
- Machine parameters
- Streamics e-Stage parameters
- Structures
- 3D Nester profiles

## 13.3.1 Import settings of previous version

If you install a new Magics, it will look for existing settings on your computer. If it finds settings of the same Magics version, it will use these settings. If it finds settings of an older version, Magics will propose to upgrade these settings. This actually works very similar to importing a Magics profile.

Magics will import the general and customized settings of the previous version. Doing so, it will also refer to the correct location for machine files, e-Stage parameters, document generation templates and fix profiles.

### *13.3.1.1 1st situation*

You are a new Magics user. The installation of Magics is performed for the first time.

Summary:

If you start Magics for the first time, Magics will search for existing settings. Because it is the first time that you start Magics, it is not able to find any settings of a previous installation. Default settings are created with all the default toolbars, Toolpages and shortcuts. You can either use these default settings to work with or you can customize them.

(See The Toolbars & The Shortcuts)

### *13.3.1.2 2nd situation*

You already worked with Magics in the past. Previously you worked with Magics X and now you want to work with the latest version of Magics.

Summary:

Like in the first situation Magics will search for existing settings at startup. Because it is the first time that you install the latest version of Magics, Magics isn't able to find up to date settings. But old settings can be found. In this case Magics is going to give you the opportunity to upgrade your settings to the latest Magics version. If you want to take advantage of this opportunity, Magics will load your own customized settings. If you don't choose to do an upgrade, Magics will load the default settings.

### *13.3.1.3 3rd situation*

You performed a re-installation of the same version of Magics. NO older version of Magics is installed.

Summary:

At startup Magics will be able to find up to date settings. (The same version of Magics was installed before) Magics will start up with the same settings as before. This can be the default settings (when no changes are made) or customized settings (when new toolbars, shortcuts are created).

#### *13.3.1.4 4th situation*

You performed a re-installation of the same version of Magics. Also an older version of Magics is installed.

Summary:

What happens when you perform a reinstallation of a Magics version, but you had in the past an older version installed? Since the same version of Magics already was installed on your computer, Magics will find the profile and will start up with this profile.

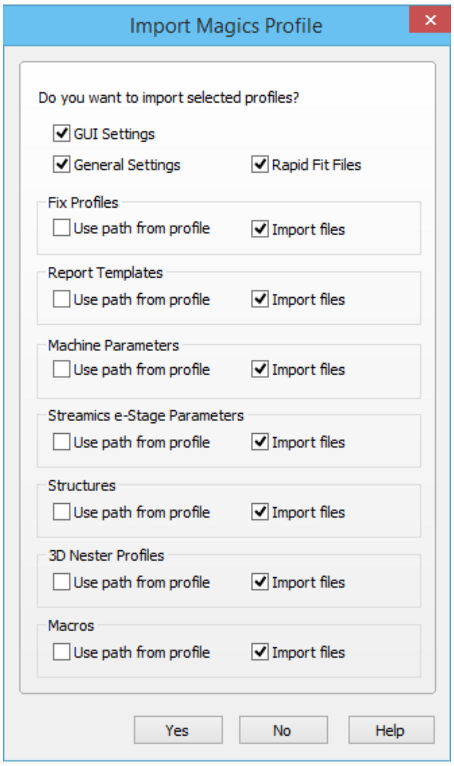
### 13.3.2 Import Magics Profile

A Magics profile can be imported from a certain location. When you import a *.mpf file, you will be asked what you want to import from the *.mpf file.

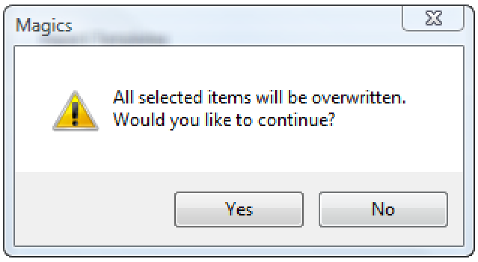
By default Magics will import the complete configuration and the configuration files will be stored in the default locations defined Magics.

The ‘Advanced’ options give you the possibility to choose what you want to import form the *.mpf file, and where you want to import it.

- The GUI settings, general settings and RapidFit files will be placed in a predefined folder.
- For the fix profiles, report templates, mmcf files, and e-Stage par file, the user can choose between:
- Importing the files in the path from profile
- Importing the files in the folders assigned in the Magics settings.
- Only referring to the path from profile and not importing the files.




*Remark*: A warning message appears when Magics detect that there is already an existing profile. This warning message is shown for each selected file type. (Fix profile, report templates, machine parameters & e-Stage parameters)




### *13.3.2.1 1st situation*

You want to configure seven Magics installations of seven computers in the same way, but the users can have their own customization, like toolbars, background color, etc...

Summary:

You install Magics on one computer. You configure Magics like you want it to be. When you are ready configuring Magics, you export a Magics Profile.

You transfer the profile to each other computer you want to configure and you import the profile. During the import, you open the advanced options and you deselect 'GUI settings'. You continue the import. The configuration will be imported without the customized GUI settings.

#### *13.3.2.2 2nd situation*

You want to restore your settings but the machine files and e-Stage parameters are on a shared network drive and you don't want to overwrite these files.

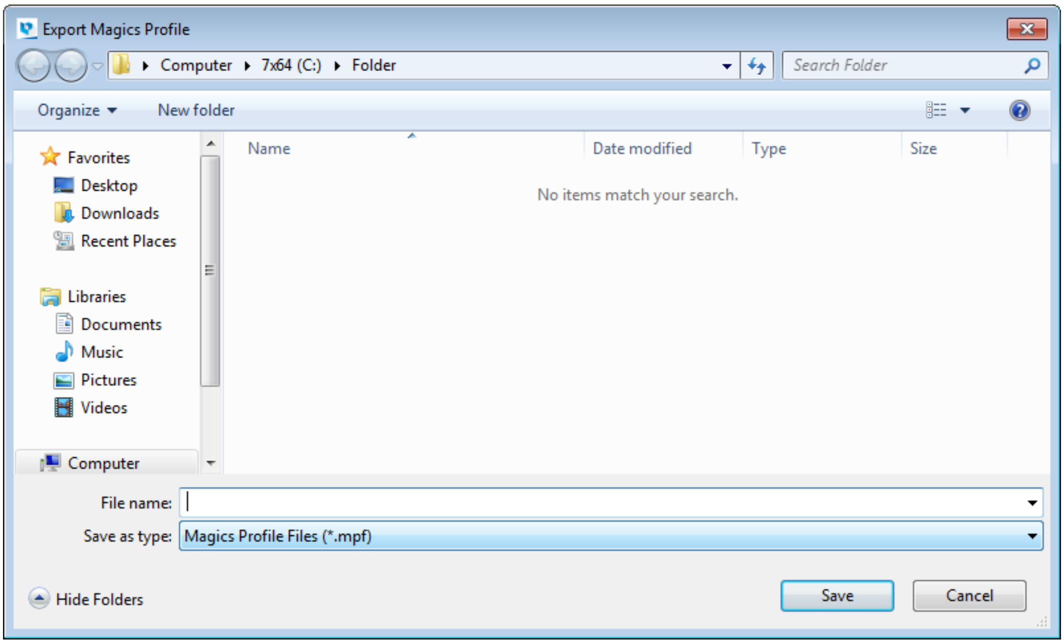
Summary:

You have to make sure you have a .mpf file with settings you want to roll back to. During import you open the advanced options and you disable 'import files' for the 'Machine Parameters' and for the 'e-Stage Parameters'. Also you enable 'Use path form profile' for both 'Machine Parameters' and 'e-Stage Parameters'. If you continue the import of the profile, Magics will point to the correct network drives, but it will add settings to this location.

### 13.3.3 Export Magics Profile


You can create a .mpf file in the 'Options' menu with the function 'Export Magics Profile …'. Magics will export all the configuration listed above to this file.

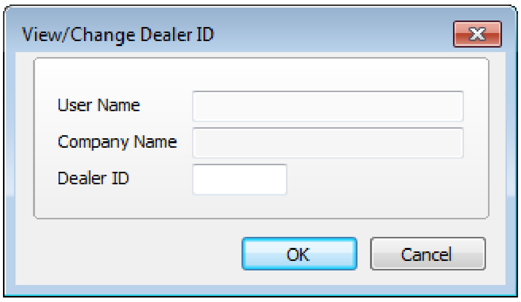
The export Magics profile option gives you the possibility to export your Magics profile to a certain directory. Magics will only save relevant files. (mmcf, e-Stage par file, stl files, *.dot files and *.xlt files) in the .mpf file.



## 13.4 Licenses


### 13.4.1 Dealer ID

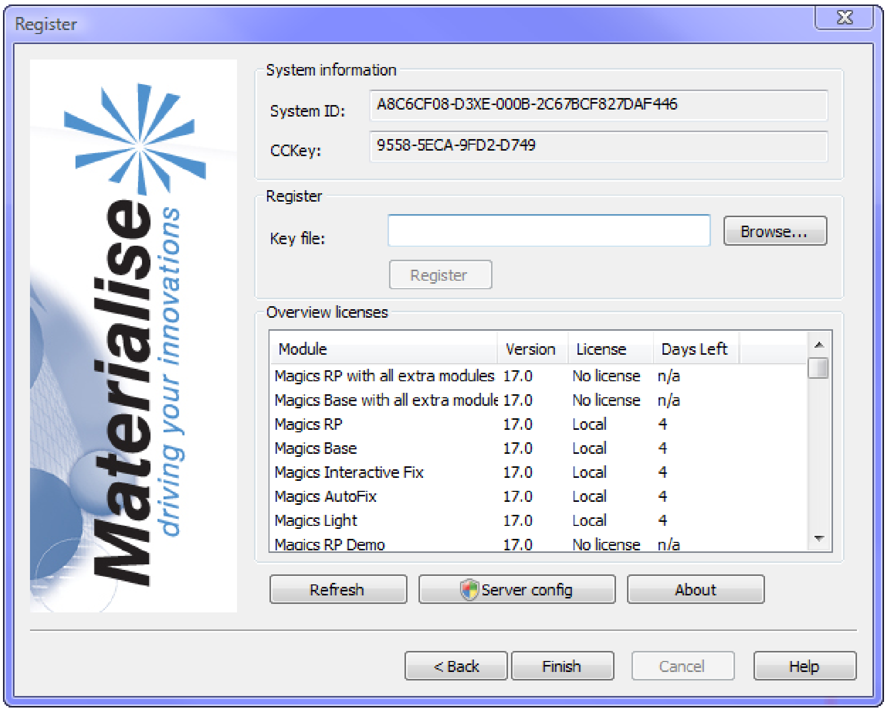
This ID mentions the dealer you bought this software from. If you work on Windows NT, you need to be administrator to change this.



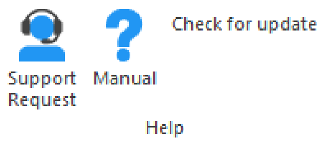

### 13.4.2 Licenses

In the Registration dialog you can display your current license situation and contact information, request key files and register new modules.

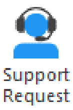
— For details, please go to: [https://help.materialise.com/](https://help.materialise.com/)




## 13.5 Help




### 13.5.1 Support Request

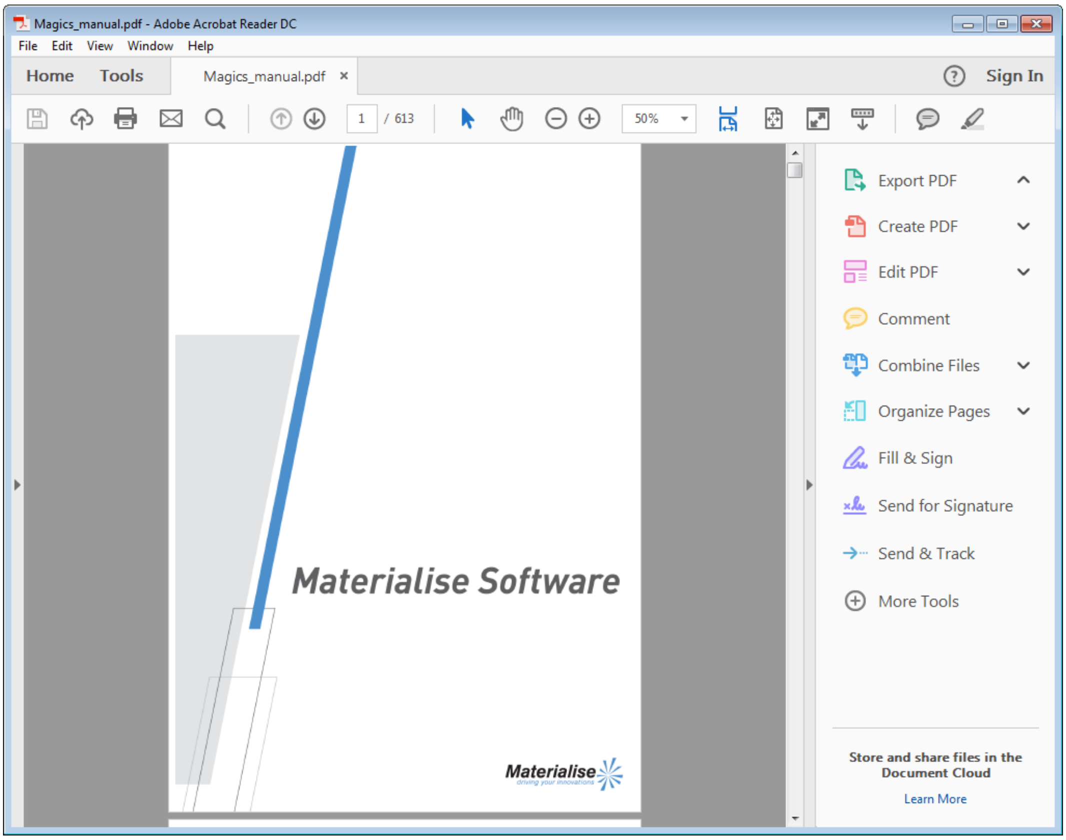



Send a support request automatically out of Magics to our customer support team.

— See Chapter 5: Support Request, page 37

### 13.5.2 Manual


The manual of Magics offers you a clear and easy way to search for more information about a function. In almost each dialog is a Help button present to open directly the Magics manual.




*Remark*: Bookmarks not enabled by default? Navigate to View -> Navigation panels -> Bookmarks

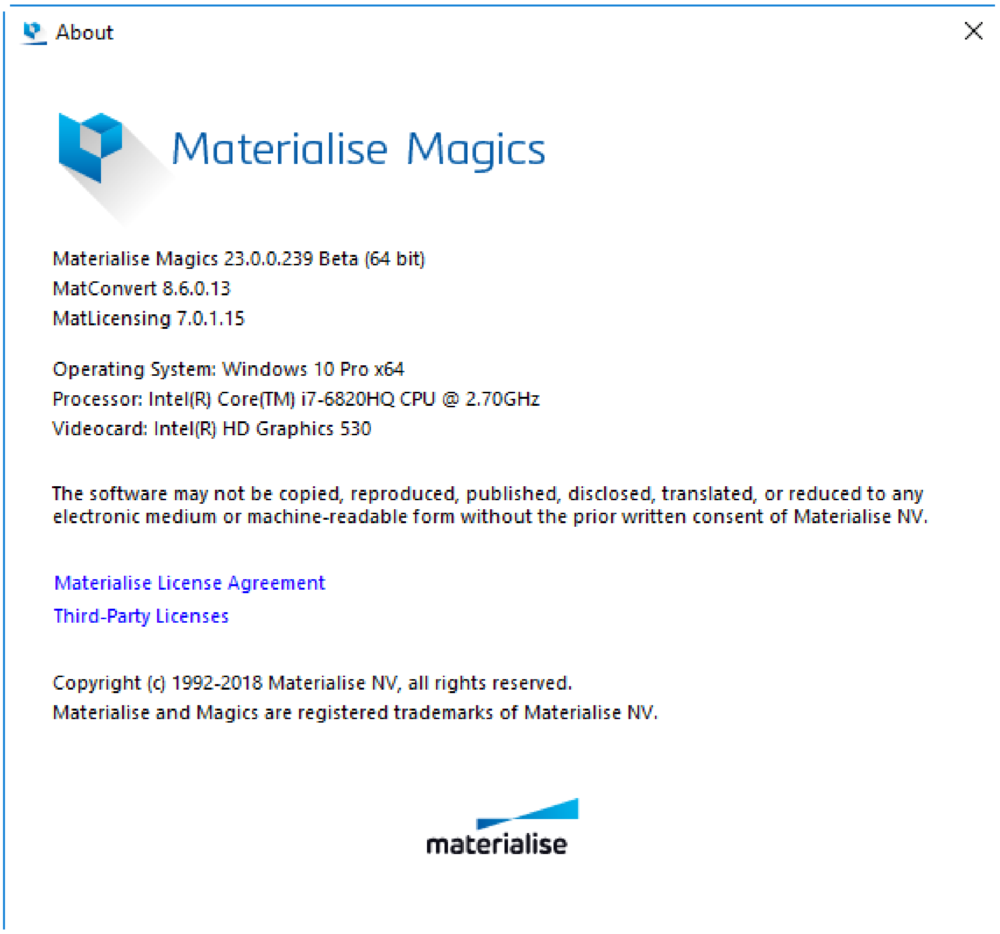
## 13.6 About


### 13.6.1 What's New

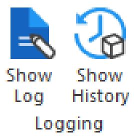

Gives an overview of the new features in the Magics software, compared to the previous version.

### 13.6.2 About Magics


Gives the version details of the Magics software, and the performance parameters of the computer the software is running on.

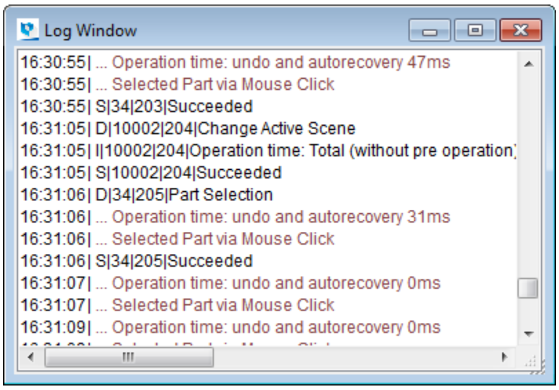



## 13.7 Logging



### 13.7.1 Show log

Show Log Shows the log of the last performed actions by the Magics software. From the moment Magics runs, all the performed actions are written down in a log file. This file is automatically saved as a *.log file. Its name * is composed in the following way: ‘Magics_year_month_date_time of first operation (hour, minutes, and seconds)’.



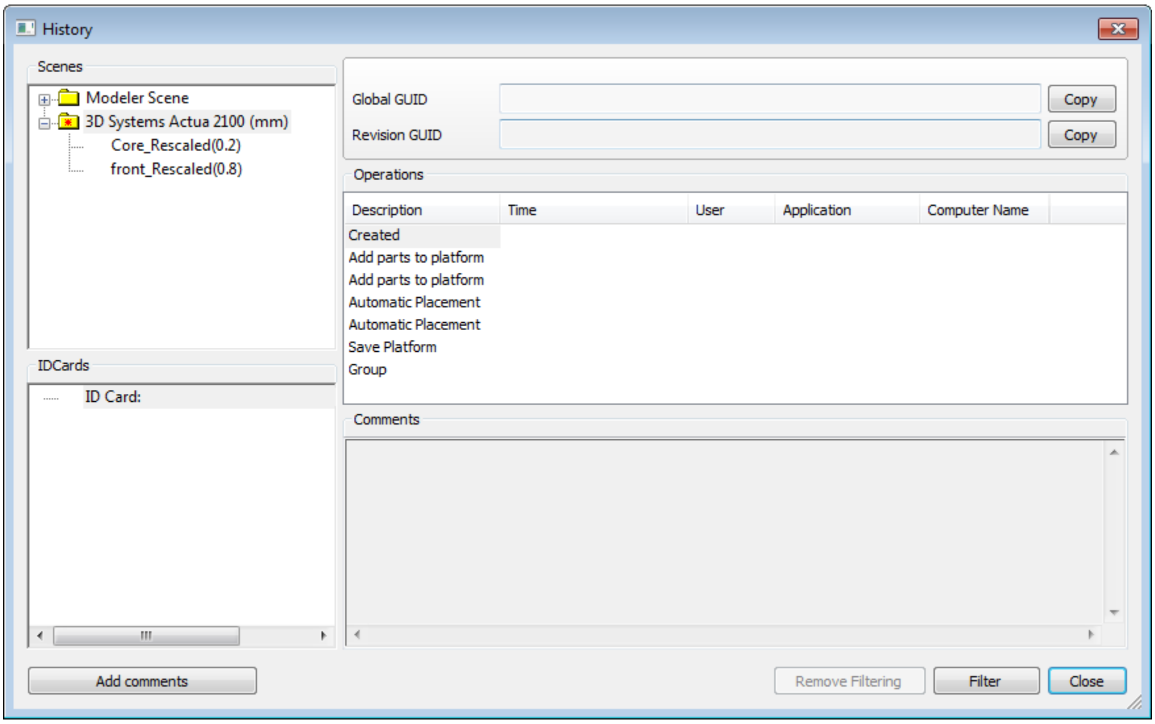

In the Settings (Settings > File I/O > Working Folder > Logging) you can define where you would like the files to be saved.

### 13.7.2 Show history

Show History The history functionality lets you trace the full history of your part and platform. All operations performed in Magics are stored in a magics project file.

History information that is stored:

| | |
|---|---|
| Description | Performed operations |
| Time | Time the operations is performed |
| User | Who performed the operation |
| Application | Magics full build number |
| Computer Name | Name of the computer used |
| Comment | Parameters of the operation |




*Remark*: Some operations have an influence on the platforms history.

**Example**:

The cut & punch operation will add a part to the platform.

# 14 Chapter 14: Toolbars

Toolbar menus can be created by the customer according to his needs. The Marking Toolbar is by default present.

## 14.1 General toolbar

### 14.1.1 View tools

#### *14.1.1.1 Zoom*

To zoom in on a region, this region has to be defined by means of a box (drag from the left upper corner to the right bottom corner). When the mouse button was pressed, but no rectangle was drawn, the Zoom In 25% function will be applied. Zooming in and out can also be done using the mouse scroll.

#### *14.1.1.2 Unzoom part*

The zoom factor will be set so that all the active parts are displayed.

#### *14.1.1.3 Unzoom platform*

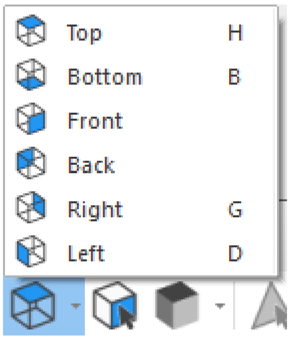
The zoom factor will be set so that the entire platform is displayed on the screen in the current view.

#### *14.1.1.4 Home View*

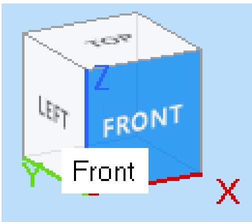
This button combines the Unzoom function and the Top Front Left ISO view option which allows the user to go back to the initial position with the best possible overview.

*14.1.1.5 Standard views*

The dropdown menu will display the list of standard views; by clicking on one view, the viewport will be updated to the selection.

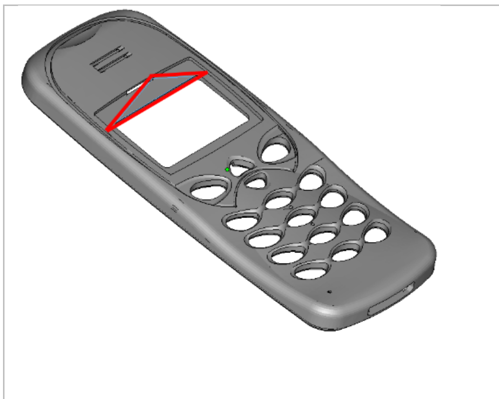
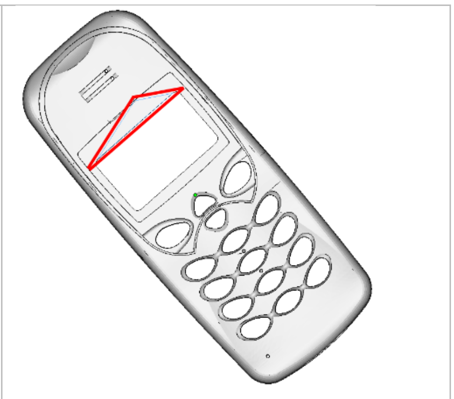



These views are also accessible by hovering over the faces of the interactive view cube, situated at the bottom right of the scene.



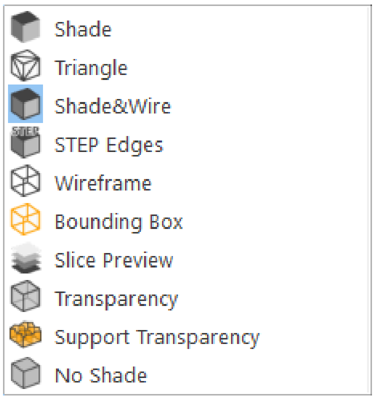

*14.1.1.6 Indicate View Orientation*

 By selecting one triangle of a part, the indicate view orientation will automatically update the viewport so that the triangle normal is perpendicular to the screen.

| | |
|---|---|
|  |  |
| The indicated triangle is used to perform the alignment. | Aligned perpendicular to the screen |

### 14.1.1.7 Shade modes

The shade modes are the ways to visualize a part.

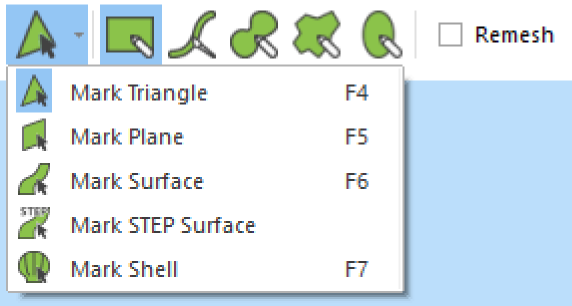



| | | |
|---|---|---|
| Shade | | This visualization mode will display the part with shades according to the direction of the triangles. |
| Triangle | | In Triangle mode, the triangles will be displayed upon the shaded part. |
| Shade&Wire | | This mode will show a combination of the Shade mode and the Wireframe mode. |
| Wireframe | | This visualization mode shows the edges of the object. This representation is deduced from the STL file. It has been tried to approach the normal wireframe representation as good as possible. But due to the limited information, STL errors and noise in the STL file, abnormalities in this representation may show up. A line of wireframe is drawn when the angle between 2 triangles exceeds a certain value. You can change this value and so adapt the wireframe view (Settings > Visualization > Wireframe). |
| Bounding Box | | This mode will only show the bounding box of the part. This mode is quick in visualization. |
| Slice Preview | | This mode will give you a preview of the slices. |
| Transparency | | Parts are shown in a transparent mode. |
| Support Transparency | | Supports are shown in a transparent mode. |
| No Shade | | Parts are shown without rendering shadows. |

## 14.1.2 Marking tools

In order to fix a corrupted STL file, the user can mark triangles of a selected part. The part must first be selected before triangles can be marked! To indicate that a triangle is marked the triangle turns (default) green. The marked triangles and edges color can be defined in the Settings.

In the general toolbar, the user can select what they would like to mark: triangles, planes, surfaces, shells… When selecting these commands, a toolbar with marking options will appear below the ribbons.



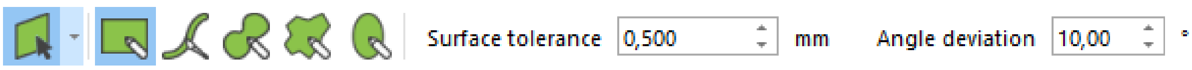

Within this toolbar, the user can switch between what they want to mark, but they can also select how they would like to mark: rectangular/free-form/brush/… selection. Additionally, more options may be shown depending on the selected tools and methods.

### *14.1.2.1 What can be marked?*

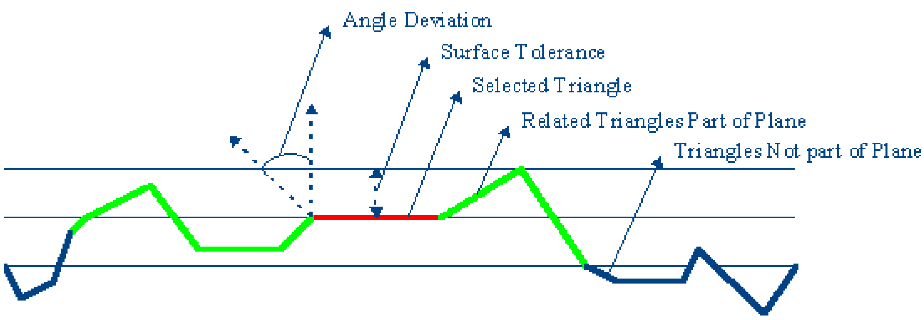
 **Mark Triangle:** (un)mark individual triangles

<u>Note:</u> The “Remesh” option is only available when “Mark Triangle” is selected.

 **Mark Plane:** (Un)mark planes. The plane is not necessary perfectly flat: the tolerance can be defined by the plane selection parameters, which will appear in the marking toolbar when selecting “Mark Plane”.




The indicated triangle will be the reference to mark the plane. Triangles that differ too much from the reference, will not be marked anymore. The user selects one triangle with the indicate plane cursor and an entire plane is marked. In order to do so, two tolerances have to be defined:

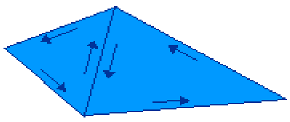


| | |
|---|---|
| Surface Tolerance | Indicates the maximum deviation in mm or inches that a related triangle may have to be part of the same plane that contains the selected triangle |
| Angle Deviation | Indicates the maximum angle in degrees between the normals of a related triangle and the selected triangle, in order to be part of the same plane. |

**Mark Surface:** (Un)mark surfaces. A surface is defined by the wireframe, which can be seen as the black lines on the parts, when the “Shade & Wire” or “Wireframe” view is activated. These black lines indicate the zones where two adjacent triangles have an angle more than the active value. (This value can be changed in Settings > Visualization > Wireframe, see Wireframe, page 345).

**Mark STEP Surface:** (Un)mark STEP surfaces. STEP surfaces are defined by the surfaces of the STEP model linked to the part.

**Mark Shell:** (Un)mark shells. A shell is defined as a limited collection of triangles correctly connected to each other. A triangle is part of a shell when the direction of rotation of the vectors of two adjacent triangles is opposite:



Direction of rotation of triangles in a shell

*14.1.2.2 How can you mark?*

**Clicking:** There is no separate option for marking through clicking. You can mark with a single click when “Rectangular Selection”, “Freeform Selection” or “Brush Selection” is active.

**Rectangular Selection:** Make a rectangular selection by click-and-dragging. Hold Alt to make a square selection.

**Brush Selection:** Make a selection by painting through click-and-dragging. Hold Ctrl and scroll to change the brush size.

Note: “Remesh” is not available when using the Brush Selection method.

**Freeform Selection:** Make a freeform selection by click-and-dragging.

 **Polygon Selection:** Make a polygon selection by clicking to place points and right-clicking to close the loop. Hold Alt to snap at 45˚ angles.

 **Ellipse Selection:** Make an elliptical selection by clicking to place 3 points. Hold Alt to make a circular selection.

Note: All triangles that are touching or within the selection will be marked. So triangles (or other objects) don't have to be completely within the selection to be marked.

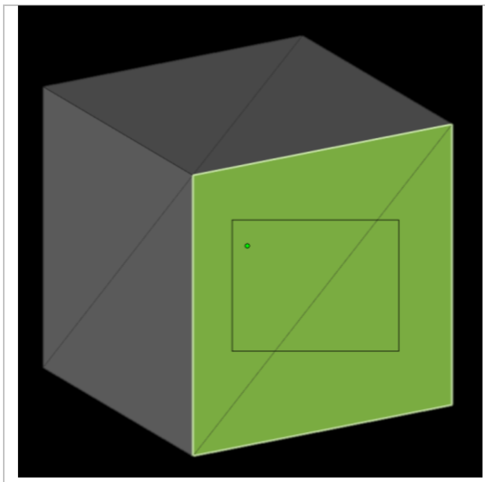
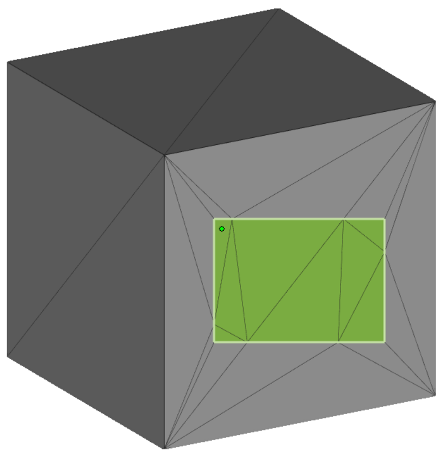
*14.1.2.3 Additional tips and options for marking:*

**Unmark:** You can unmark objects (triangles, planes, surfaces, shells) by clicking them again. If you want to unmark using another type of selection, hold Shift.

**Mark through:** You can hold Ctrl to mark through a part.

**Mark flipped triangles:** By default, you can only mark triangles that are not flipped. To mark flipped triangles (when the red side is visible), hold X.

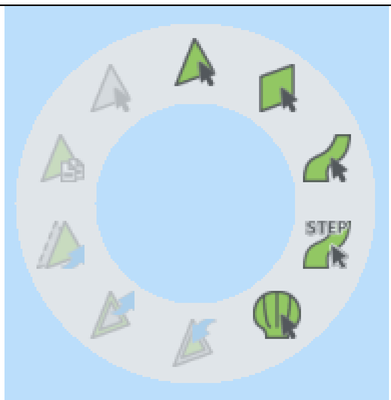
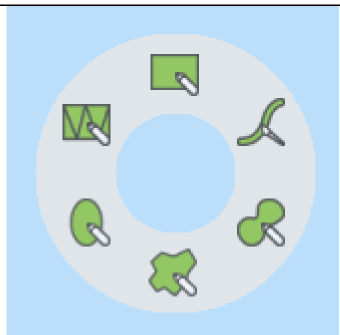
**Mark with Remesh:** When marking triangles, it is possible to enable "Remesh" in the marking toolbar. When "Remesh" is enabled, new triangles will be created to allow for a precise marking.

| | |
|---|---|
|  |  |
| Rectangular marking without Remesh | Rectangular marking with Remesh |

Note: You can also remesh parts with this tool without marking, by holding Shift.

**Confine marking:** This option is available for Make plane, Make surface and Mark shell. When this option is on, marking or unmarking will be limited with the boundaries that defined by the previously marked area or the invisible triangles.

**Context menus**: these are introduced for an easy switch under the marking mode.

| | |
|---|---|
|  |  |
| M + RMB to switch among marking objectives. The shortcut can be customized in the Customize UI dialog. | Ctrl + RMB to switch among marking options |

### *14.1.2.4 Advanced marking*

#### 14.1.2.4.1 Mark Color

 When you use this button, you can select any area of triangles with the same color. When pressing “Shift” when clicking on a colored triangle, all triangles of the part with the same color will be marked (they do not have to be connected).

#### 14.1.2.4.2 Mark Texture

 Click a texture on your part to mark all the triangles it covers.

#### 14.1.2.4.3 Mark Horizontal

 Mark all horizontal triangles.

#### 14.1.2.4.4 Mark Vertical

 Mark all vertical triangles.

#### 14.1.2.4.5 Mark Contour

Mark all triangles that are part of the selected contour.

#### 14.1.2.4.6 Select Noise Shells

Mark all noise shells of the selected part(s).

### *14.1.2.5 Invert Marked*

With the toggle button the selection of marked triangles is inverted: all unmarked triangles turn green (or the defined marked triangles color) and vice versa.

### *14.1.2.6 Modify marking*

#### 14.1.2.6.1 Expand Selection

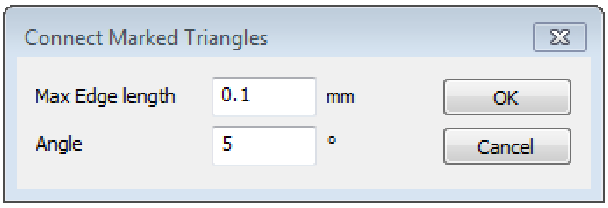
The group of selected triangles will become bigger. All unmarked triangles lying next to a marked triangle will be marked.

#### 14.1.2.6.2 Shrink Selection

The group of selected triangles will become smaller. All triangles lying at the border of the group will be unmarked.

#### 14.1.2.6.3 Connect Marked

When marking triangles, it can be difficult to select the very thin triangles. With this function, Magics will mark thin triangles between 2 marked triangles. When you click on this icon, you need to enter two parameters.




| | |
|---|---|
| Max edge length | When the distance between 2 marked triangles is smaller than the given value, the triangles in between will be marked. |
| Angle | If the two selected triangles are too inclined towards each other- if their normals have an angle bigger then the value – the connect function will not work. |

### *14.1.2.7 Delete marked triangles*

The marked triangles are deleted.

### *14.1.2.8 Copy marked*

The marked triangles are copied, a new part is created in the part list.

### *14.1.2.9 Separate marked*

The marked triangles are separated from the original part and stored in a separate part.

### *14.1.2.10 Unmark All*

All triangles will be unmarked.

### *14.1.2.11 Hide Marked*

The marked triangles are hidden.

#### *14.1.2.12 Make All Visible*

Make all triangles visible.

#### *14.1.2.13 Invert Triangle Visibility*

Make invisible triangles visible and vice versa.

## 14.1.3 Errors visualization

### *14.1.3.1 Bad edges visibility*

#### 14.1.3.1.1 Bad Edges Visible

Defects in the STL file can be detected graphically. All edges that are not shared by exactly 2 triangles will be displayed in yellow on the screen.

#### 14.1.3.1.2 Bad Edges Hidden Line

Hide the indication of the bad edges that are situated behind or inside the part.

#### 14.1.3.1.3 Highlight Bad Edges

Bad edges are sometimes difficult to spot. The bad edges are drawn with thick lines to be seen easily.

### *14.1.3.2 Flipped triangles visibility*

#### 14.1.3.2.1 Flipped Triangles Visible

Defects in the STL file can be detected graphically. All triangles with a normal pointing into the screen are displayed in the Flipped Triangles color, which is by default red. Remaining red triangles in the shading indicate defects in the STL file (triangles with wrong-oriented normal, missing or overlapping triangles).

#### 14.1.3.2.2 Flipped Triangles As Normal

Shows the flipped triangles as normal triangles.

## 14.2 Additional tools

### 14.2.1 Border marked Triangles

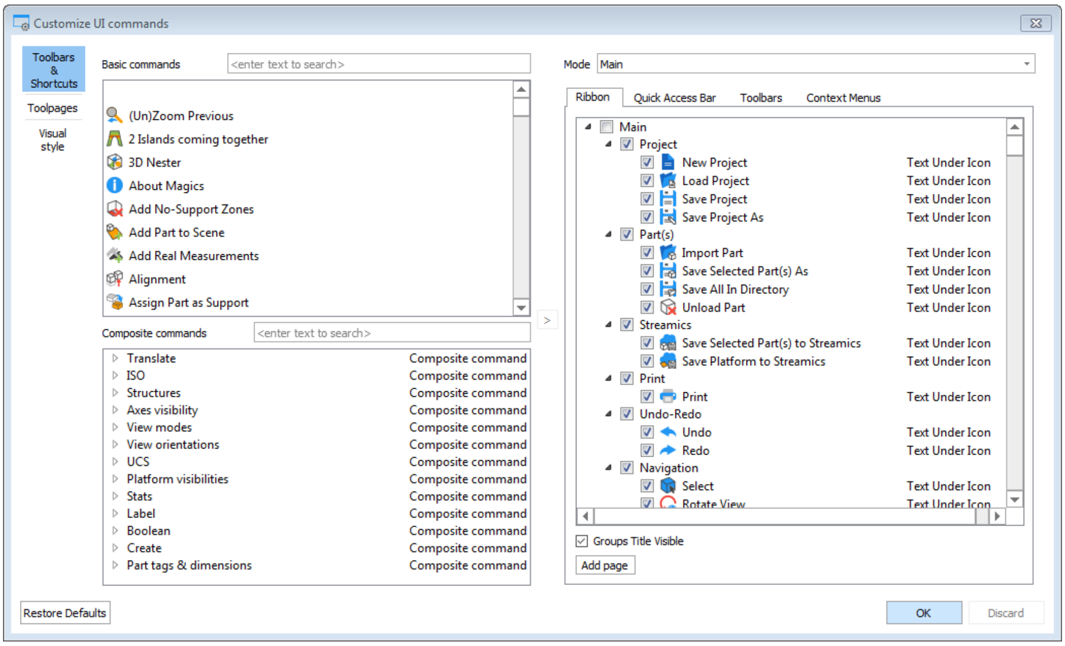
The border of the marked triangles is indicated by a red line or not shown.

This command is not present by default in the toolbar, but it can be added via the Customize UI dialog.

— See Chapter 15: Customizations for more information

# 15 Chapter 15: Customizations

It is possible to customize the different Ribbon pages, the Quick Access Bar, Toolbars and Context menus.



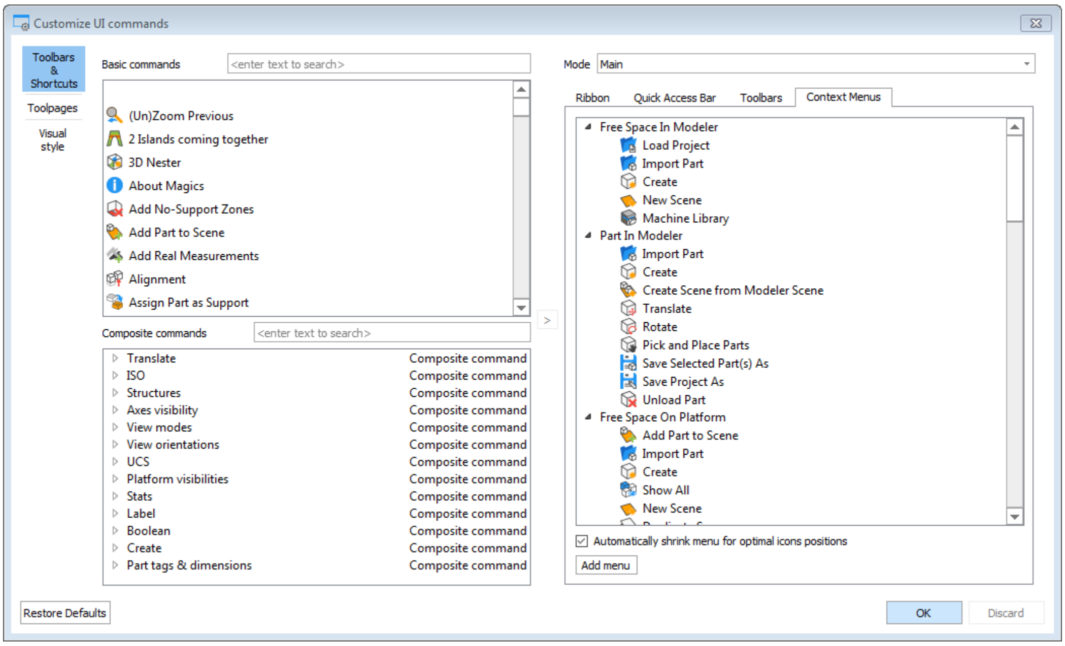

A ribbon page consists of a number of icons that allow easy access to a particular dialog window. By holding the mouse pointer on an icon, the Tooltip of the function will appear.

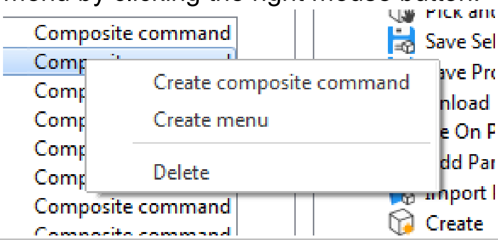
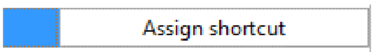
## 15.1 Customizing Ribbon & Toolbars

Magics gives the user total freedom to customize the ribbon pages.

- Default ribbon pages
- Custom ribbon pages
-

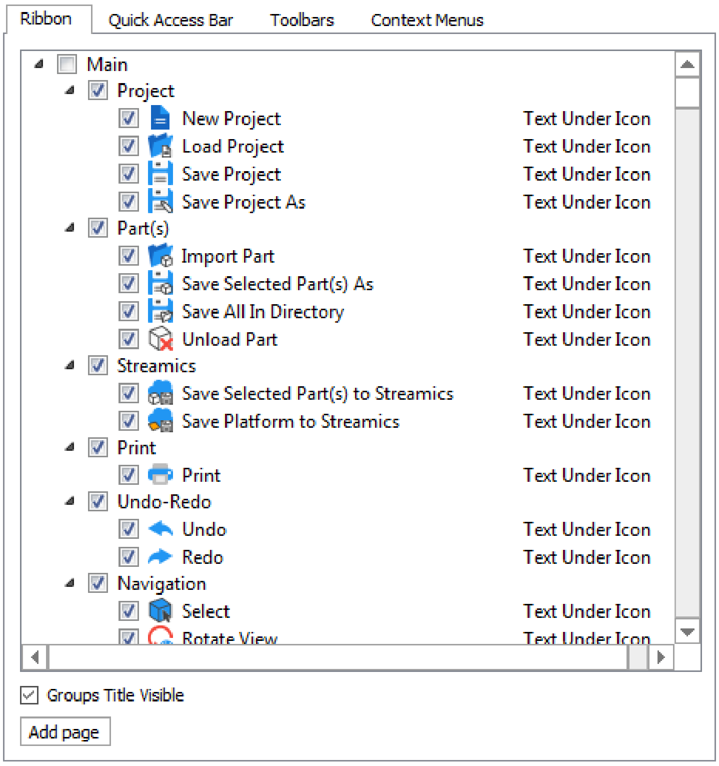
The user cannot delete, rename or edit the Build Processor and Plug-ins ribbon pages. The other default ribbon pages can be renamed, edited and deleted. The custom ribbon pages are created, named and defined by the user. These custom ribbon pages can be deleted.




| | | |
|---|---|---|
| Commands | Two lists:<br>- basic commands<br>- composite commands | |
| | basic commands | A list of all the basic commands in Magics. If present, the keyboard shortcut is shown next to the command.<br>Scroll through the list, or use the search box to find a specific command. |
| | Composite commands | The second list contains all the composite commands. A composite command contains a number of grouped functions.<br>Scroll through the list, or use the search box to find a specific command. |
| | | Make your own Composite commands or menu by clicking the right mouse button:   |
| Search box   | Search box for the Basic Commands and Composite Commands lists. | |
| Rename | To rename, doubleclick on the name you wish to change. | |
| Delete | To delete a custom ribbon… | |
| Keyboard shortcut | To assign or delete a keyboard shortcut, doubleclick the shortcut area and enter or delete the shortcut.   | |

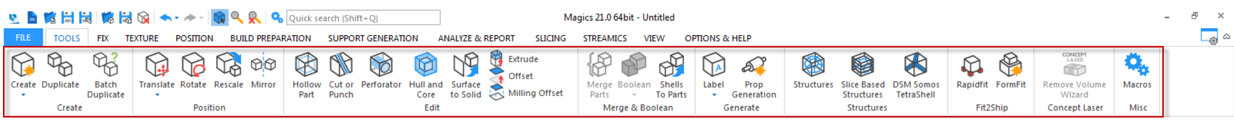
| | | |
|---|---|---|
| Restore Defaults | Restores the defaults settings for the entire Customize UI window. | |
| > | The selected function in the Function list of the commands will be added to the Function List of the selected ribbon or toolbar. The selected function in the Function list of the commands remains in this list, so it can be visualized multiple times | |
| Mode | Depending on the active licences, different modes are available. | |
| | Main | By default available |
| | Support | Available with SG/SG+ Supports |
| | RapidFit | Available with Fit2Ship |
| | CalCard | Available with CalCard |
| | Concept Laser | Avaialble with Concept Laser Slicer |
| Ribbon & toolbars | Four lists:<br>— Ribbon<br>— Quick Access Bar<br>— Toolbars<br>— Context Menus | |
| | Ribbon | The Ribbon list contains all existing ribbon pages. The visible ribbons and functions have a check. |
| | Quick Access Bar | The Quick Access bar contains all the functions available via the Quick Access Bar. The visible functions have a check. |
| | Toolbars | The Toolbars list contains all Toolbars and their available functions. The visible toolbars and functions have a check. There is one default toolbar: Marking. Other toolbars can be custom made and added by the user. |
| | Context Menus | The Context Menus list shows all available context menus and their available functions. |

## 15.1.1 Ribbon




| | |
|---|---|
| Checkbox ☑ | Checkmark indicates whether an item will be visible or not. |
| | Adds a separator line before/after functions in the Function List of the selected toolbar. |
| Visualization | At the right side, the visualization in the ribbon or toolbar is shown.<br>The following visualizations are available:<br>— Icon only<br>— Text only<br>— Text under icon<br>— Text next to icon |
| Groups title visible | When checked, the groups title in the ribbons is visible |
| Add page | The Add page command adds a custom page, to make a custom ribbon. |

### *15.1.1.1 The Default Ribbon pages*



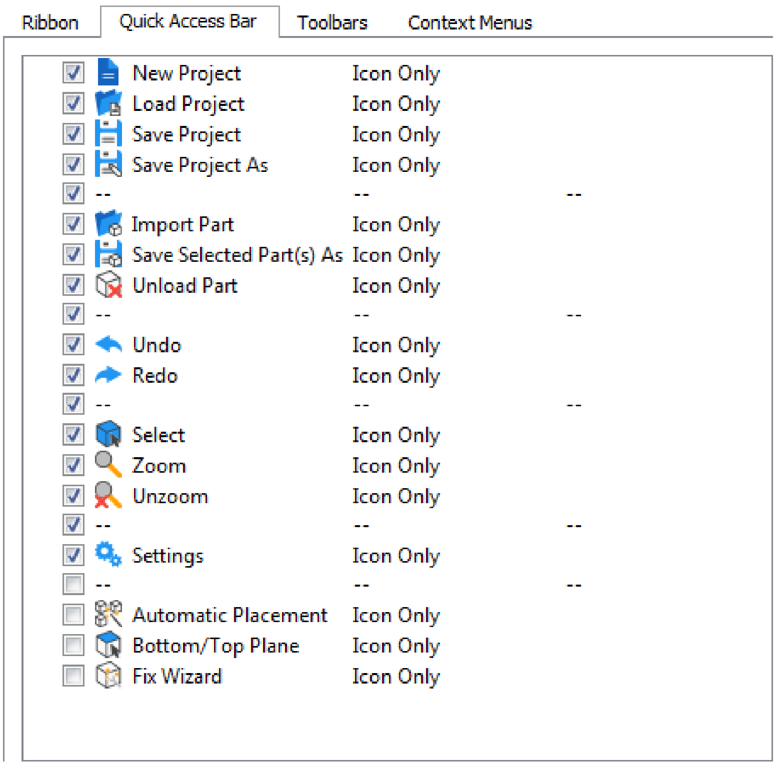
The default ribbon pages are standard in Magics. Each groups a number of functions that logically fit together. Some icons may appear on multiple ribbon pages, if they fit in more than one cluster of functions.

The default ribbon pages are:

- File
- Tools
- Fix
- Texture
- Position
- Build Preparation
- Support Generation (available with SG/SG+ or Tree Supports module)
- Analyze & Report
- Slicing (available with Slice module)
- Streamics (available with Streamics)
- View
- Options & Help


- For more information about these ribbon pages, see User interface, page 19.
- For detailed information about every ribbon pages, see The Ribbon pages, page 20


### 15.1.2 Quick Access Bar

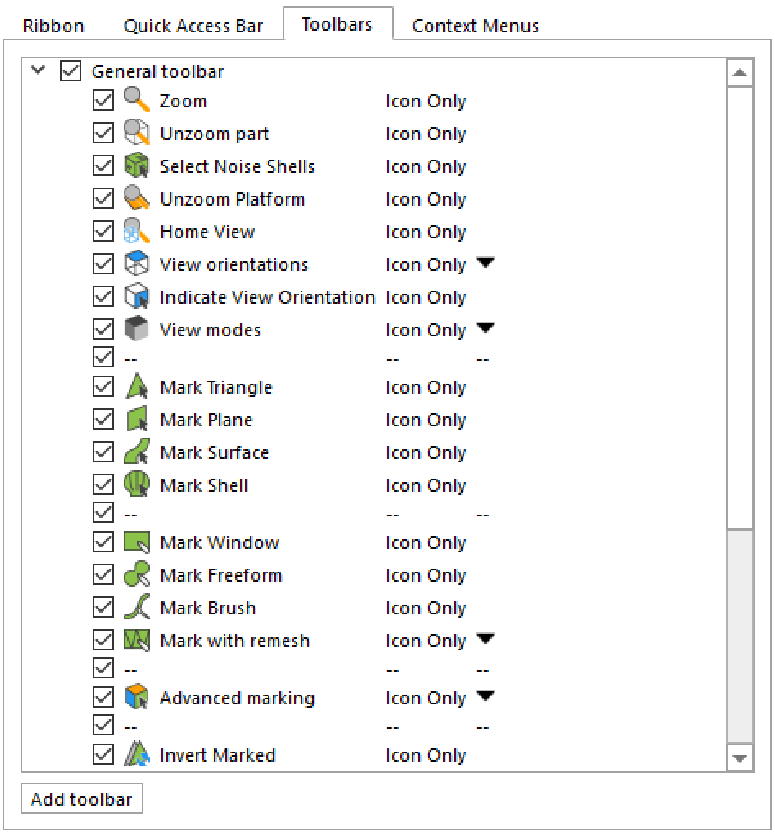



| | |
|---|---|
| Checkbox ☑ | Checkmark indicates whether an item will be visible or not. |

| | |
|---|---|
| Visualization | At the right side, the visualization in the ribbon or toolbar is shown.<br>Th following visualizations are available:<br>- Icon only<br>- Text only<br>- Text next to icon |
| Add separator | The Add separator command adds a separator to the quick access bar. |

### 15.1.3 Toolbars

Toolbar menus can be created by the customer according to his needs. The general toolbar is by default present.

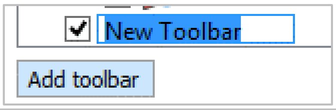



| | |
|---|---|
| Check box ☑ | Checkmark indicates whether an item will be visible or not. |
| Visualization | At the right side, the visualization in the ribbon or toolbar is shown.<br>Th following visualizations are available:<br>— Icon only<br>— Text only<br>— Text under icon<br>— Text next to icon |

| | |
|---|---|
| Add toolbar | The Add toolbar command adds a custom toolbar to the toolbars menu. |
| Insert toolbar before | Visible when a toolbar is selected. Insert a toobar before the selected one. |
| Insert toolbar after | Visible when a toolbar is selected. Insert a toobar after the selected one. |
| Delete toolbar | Visible when a toolbar is selected. Delete the selected toolbar. |
| Add separator | Visible when a toolbar or command is selected. Add a separator into the toolbar. |

*15.1.3.1 Creating a custom toolbar*

To create a custom toolbar, proceed as follows:

| | |
|---|---|
| 1. | Click Add toolbar to add a new toolbar. |
| 2. | Enter a name for the new toolbar.   |
| 3. | Add commands by selecting a basic or composite command and dragging it to the new toolbar.<br>By adding a separator, you can make different groups within your toolbar. |
| 4. | Click OK to confirm the creation.<br>The toolbar is now visible in the toolbars at the left side of the work area. The visibility of the toolbar can be altered by dragging:<br>— fixed height of the toolbar<br>— Location of the toolbar: below or next to other toolbars. |

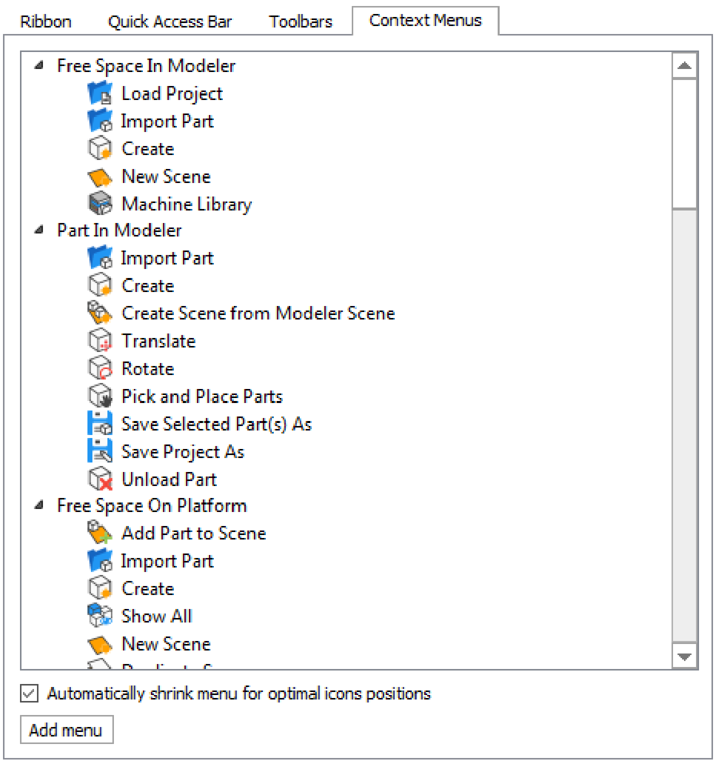
## 15.1.4 Context Menus

The context menu in the workspace is a quick access point to frequently used function. The usage of the context menu can speed up the general workflow. Depending from where the menu is called, the functions can be different.

Magics gives the user total freedom to customize the menus. Two types of menus are present:

- Default menus
- Custom menus

The user cannot delete nor rename the default menus, the freedom concerning these menus is limited to the removal or adding of buttons in the respective menu. The custom menus are created, named and defined by the user. These custom menus can be deleted.

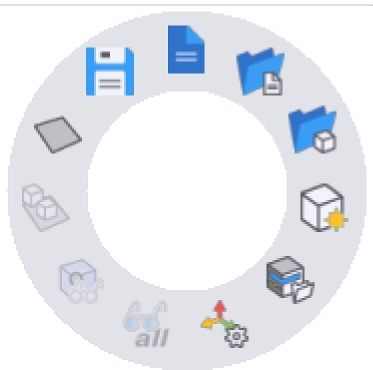


| | |
|---|---|
| Default menus | The Menu list contains some predefined menus depending on the location and amount of parts loaded in Magics.<br>— Free space in modeler<br>— Free space on platform<br>— Part in modeler<br>— Part on platform |
| Automatically shrink menu for optimal icons position | The menu will be sized according to the chosen functions. |
| Add menu | Initiates the creation of a custom menu, the user has to define a name. |

### *15.1.4.1 Default menus*

By default there are 4 menus available.

The predefined menus can be accessed by clicking on the right mouse button, depending from where you try to activate it or if a part is loaded following menus will be shown.

| Modeler scene – No part loaded | Platform scene – No part loaded |
|---|---|
|  |  |
| Modeler scene – Part loaded | Platform scene – Part loaded |
|  |  |

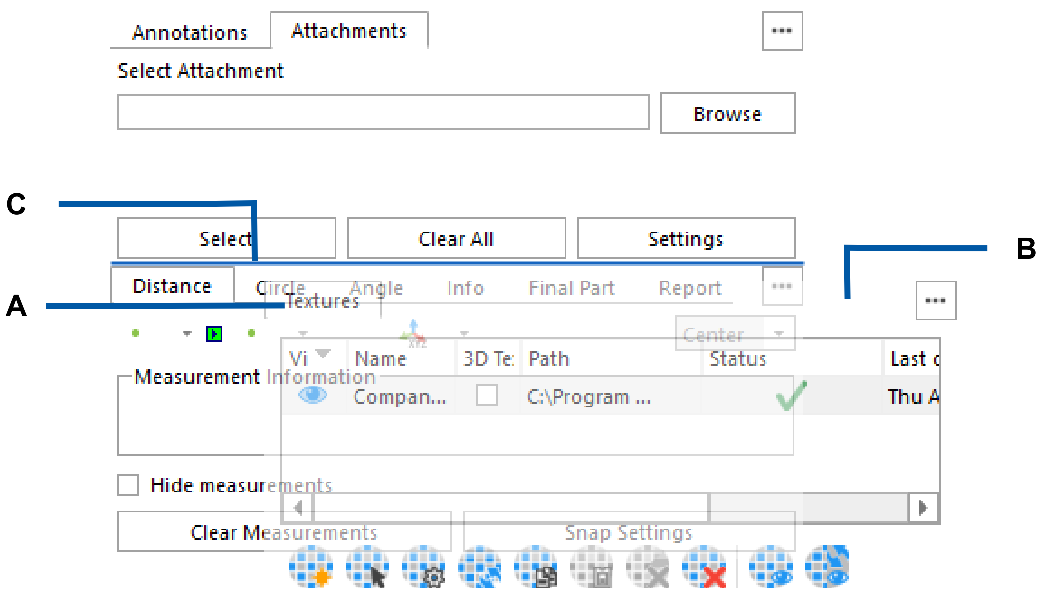
## 15.2 Customize Toolpages

You can create a custom workspace by moving and visualizing toolpages, based on your specific needs. This customization can be achieved directly from the workspace or from the Customize UI window.

### 15.2.1 Move and group toolpages

As you move toolpages, you will see highlighted drop zones, which are areas where you can drop the panel into – e.g. user can move a toolpage up or down in a dock by dragging it to the narrow drop zone above or below another toolpage. The position of the mouse (not the position of the toolpage), activates the drop zone.

- To move a single toolpage, drag it by its tab
- To move a group, drag the tab bar (the solid space next to the last tab)




A: tab – B: tab bar – C: highlighted drop zone

A toolpage can be dragged to an area where there is no drop zone: the toolpage (or toolpages group) floats freely on the workspace – e.g. user can move a toolpage to a second screen connected to the laptop.

You can manipulate a toolpages group:

- To move a toolpage into a group, drag the toolpage tab to the highlighted drop zone in the group (the group tab bar)
- To rearrange toolpages in a group, drag a toolpage tab horizontally to a new location in the group

- To remove a toolpage from a group, drag the toolpage by its tab outside the group

### 15.2.2 Dock area

A *dock* is a collection of toolpages or toolpages groups displayed together on the extreme left or right side of the workspace. The dock area occupies the entire height of the scene side, and the toolpages are always visible.

You can dock and undock toolpages by moving them into and out of a dock.

- To dock a single toolpage, drag it by its tab into the dock, at the top, bottom or in between other toolpages
- To dock a toolpages group, drag it by its tab bar (the solid space next to the last tab) into the dock, at the top, bottom or in between other toolpages
- To remove a toolpage or a toolpages group, drag it out of the dock by its tab or tab bar. You can drag it back into the dock on another position, into the toolbar or make it free-floating

If you remove all toolpages from a dock, the dock disappears. A dock can be created again by moving a toolpage or a toolpages group to the left or right side of the workspace until a drop zone appears.

### 15.2.3 Toolpages toolbar

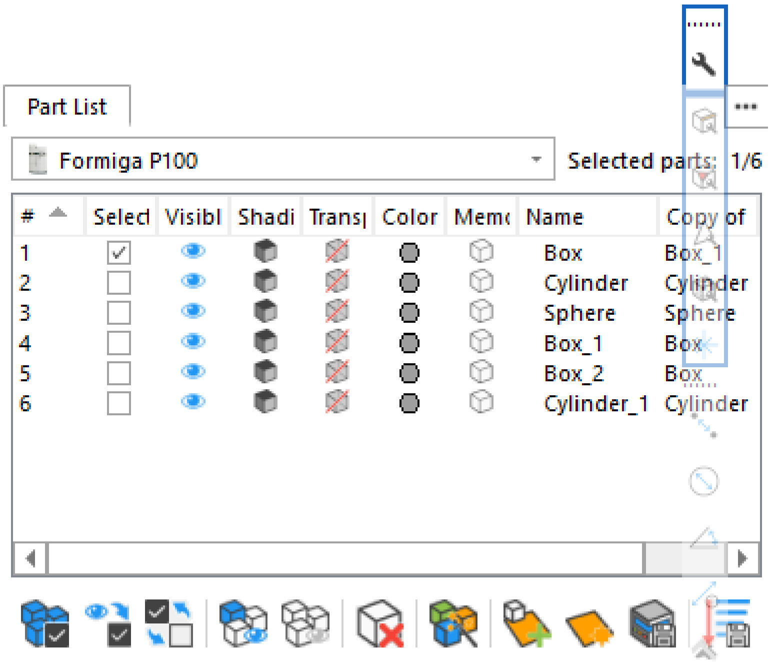
A *toolpages toolbar* is a collection of toolpages or toolpages groups displayed together in between the dock area and the scene, on the left or right side of the scene.

Each toolpages group is identified by a section in the toolbar. At the top of the section there is a dotted line. Each section contains icons, which are linked to each toolpage present in the group. You can click on the icon to show or hide the toolpage.

- To move a toolpage on a toolbar, drag its icon
- To move a toolpages group on a toolbar, drag the section dotted line

You can move toolpages to the toolbar by moving them into and out of a toolbar:

- To add a toolpage to the toolbar, drag it by its tab into the toolbar, at the top, bottom or in between other toolpages
- To add a toolpages group to the toolbar, drag it by its tab bar into the toolbar, at the top, bottom or in between other toolpages
- To add a toolpage or a toolpages group to an existing group, drag it at the top, bottom of a section or in between icons by its tab or tab bar.




— To remove a toolpage or a toolpages group, drag it out of the toolbar by its icon or section dotted line. You can drag it back into the toolbar on another position, into the dock or make it free-floating

If you remove all toolpages from a toolbar, the toolbar disappears. The toolbar can be created again by moving a toolpage or a toolpages group to the left or right side of the workspace until a drop zone appears.

### 15.2.4 Free-floating toolpages

When user drags a toolpage or a toolpage group out of its dock or toolbar but not into a drop zone, it floats freely. The floating toolpage allows user to position it anywhere in the workspace.

You can stack floating toolpages or toolpages groups so that they move as a unit when you drag the topmost bar.

— To stack floating toolpages, drag a toolpage to the top or bottom of the stack or in between other toolpages
— To change the stacking order, drag a toolpage or a toolpages group up or down by its tab or tab bar
— To remove a toolpage or toolpages group from the stack, so that it floats by itself, drag it out by its tab or tab bar

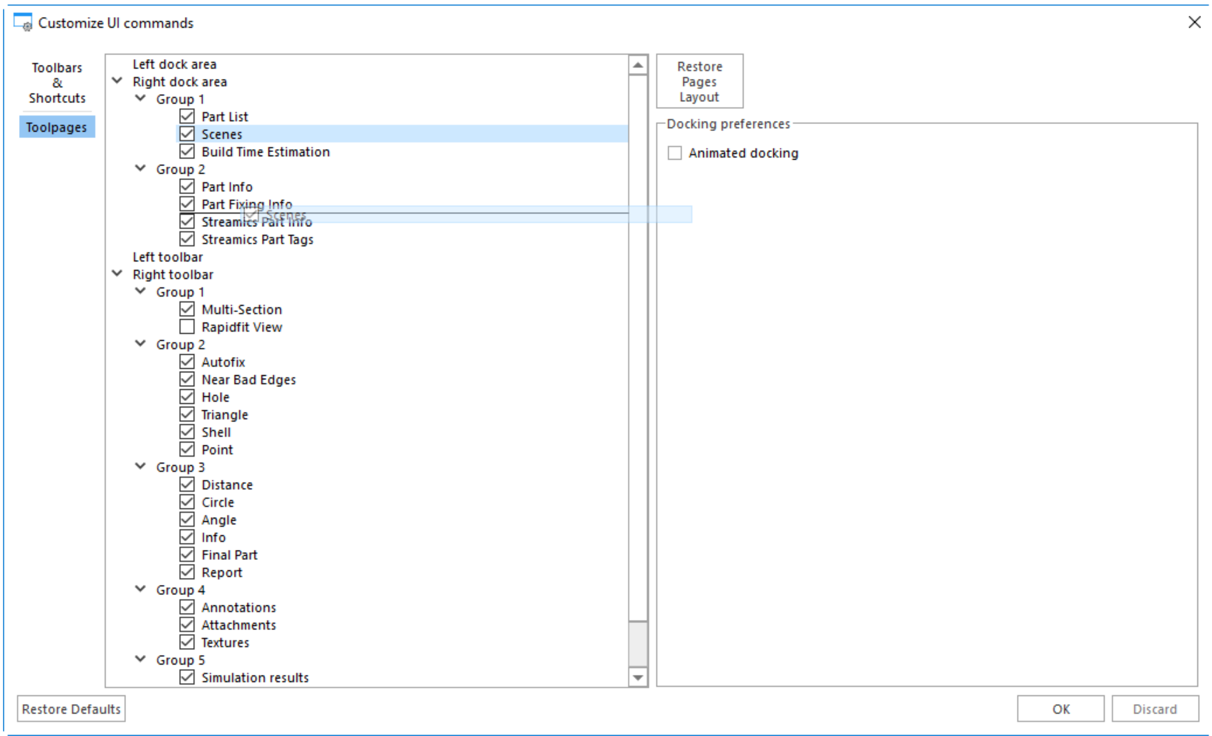
### 15.2.5 Customize UI window

The following customizations can be achieved from the Customize UI window:

— Control visualization of a toolpages by selecting the checkbox next to it
— Add a toolpage to an existing group by dragging the toolpage item to a group item or in between toolpages items.

— Create a new group by dragging the toolpage item to an area item (dock area, toolbar, floating pages)

The customization is applied automatically to the workspace, and the tree list always represents the current location of toolpages.



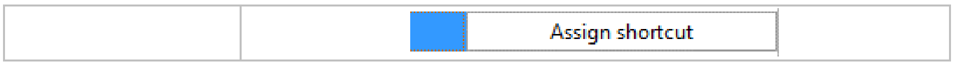

| | |
|---|---|
| Checkbox | Checkmark indicates whether an item will be visible or not. |
| Restore Defaults | Restores the defaults settings for the entire Customize UI window. |
| Restore Pages Layout | Restores the default settings for the position and visibility of the pages. |

## 15.3 Customize Shortcuts

Magics gives the user the freedom to assign shortcuts to frequently used functions. The user can define shortcuts for functions that by default do not have a shortcut, or already predefined shortcuts can be changed to the needs of the user.

Changing shortcuts is available in the Basic Commands list

| | |
|---|---|
| Keyboard shortcut | To assign or delete a keyboard shortcut, double-click the shortcut area and enter or delete the shortcut. |




### 15.3.1 Default shortcuts overview

#### *15.3.1.1 General*

| | |
|---|---|
| Manual | F1 |
| Settings | F12 |
| Undo | Ctrl+Z |
| Redo | Ctrl+Y |
| Cut | Ctrl+X |
| Copy | Ctrl+C |
| Paste | Ctrl+V |
| Select | F2 |
| Group | Ctrl+G |
| Ungroup | Shift+G |
| Customize UI | Alt+C |
| Print | Ctrl+P |
| Switch Units | Ctrl+Alt+1 |

#### *15.3.1.2 File*

| | |
|---|---|
| New Project | Ctrl+N |
| Load Project | Ctrl+O |
| Save Project | Ctrl+Shift+S |
| Import Part | Ctrl+L |
| Save Selected Part(s) As | Ctrl+S |
| Rename part(s) | Shift+R |
| Unload Part | Ctrl+U |

#### *15.3.1.3 View*

| | |
|---|---|
| Back | 9 |
| Front | 7 |
| Left | 4 |
| Right | 6 |
| Top | 8 |

Bottom ..........................................................................................2
Home View ..................................................................................... Q
Zoom .............................................................................................. Alt+Z
Zoom In .......................................................................................... Ctrl++
Zoom Out ....................................................................................... Ctrl+-
Unzoom part .................................................................................. Alt+U
Tag ID ............................................................................................ F9
Tag Names ..................................................................................... F10
Tag Path ........................................................................................ F11

*15.3.1.4 Align*

Translate ........................................................................................ T
Translate to Default Z Position ................................................... Home
Original Position ............................................................................ Ctrl+Shift+P
Rotate ............................................................................................. R
Pick and Place Parts ..................................................................... F3
Mirror .............................................................................................. Ctrl+M
Automatic Placement ..................................................................... Ctrl+A

*15.3.1.5 Mark*

Mark Triangle ................................................................................. F5
Mark Plane ..................................................................................... F6
Mark Shell ...................................................................................... F7
Mark Window with Remesh ............................................................ Alt+Shift+R
Shrink Selection ............................................................................ Down
Expand Selection .......................................................................... Up
Invert Marked ................................................................................ O
Unmark All ..................................................................................... F8
Hide Marked .................................................................................. Ctrl+Shift+H
Make All Visible ............................................................................ Ctrl+H
Invert Triangle Visibility ............................................................... Ctrl+I
Delete Marked Triangles .............................................................. Del
Copy Marked .................................................................................. Alt+Shift+D
Separate Marked ............................................................................ Alt+Shift+X

### 15.3.1.6 Fix

AutoFix ........ Alt+F
ShrinkWrap Part ........ W
Normals Fix ........ Shift+N
Automatic Stitching ........ Shift+C
Stitch (manual) ........ Shift+E
Holes Fix ........ Shift+H
Fill Hole Mode ........ Ctrl+Shift+B
Shells ........ Shift+S
Noise Shells ........ Shift+I
Triangles ........ Shift+T
Filter Sharp Triangles ........ Shift+F
Detect Intersecting ........ Ctrl+Shift+Q
Detect Overlapping Triangles ........ Ctrl+Shift+O
Overlaps ........ Shift+O
Create Triangle ........ Ctrl+Shift+E
Delete Triangle ........ Shift+D
Create Bridge ........ Ctrl+Shift+Z
Triangle Reduction ........ Ctrl+T

### 15.3.1.7 Edit

Boolean ........ Ctrl+B
Cut or Punch ........ C
Duplicate ........ Ctrl+D
Extrude ........ Ctrl+E
Rescale ........ Ctrl+R

### 15.3.1.8 Analyze

Wall Thickness Analysis ........ Shift+W
Measurement Thickness ........ Ctrl+Shift+C
Measurement Distance Point to Point ........ Ctrl+Shift+X

### 15.3.1.9 Slice

Slice Preview ........ Alt+P

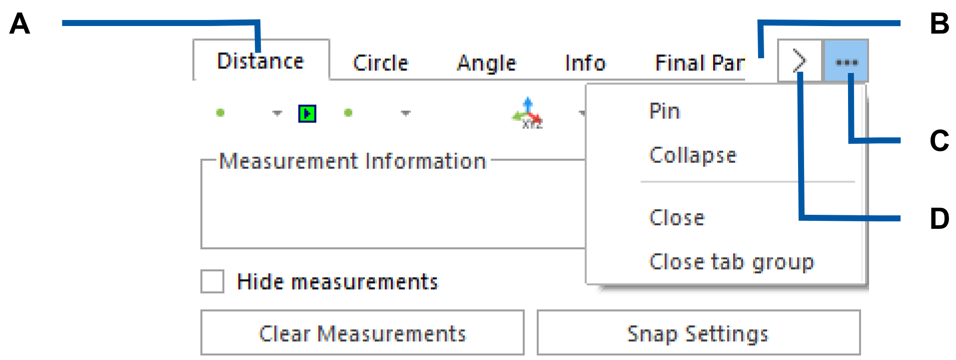
Slice Selected ............................................................................................ Alt+I

# 16 Chapter 16: The Toolpages

The toolpages are panels that contain content and actions about a single topic – e.g. measurements too to determine a distance.

You get easy access to relevant content and/or actions grouped on a single topic per toolpage. You can decide which toolpages to visualize, depending on specific needs: dock a toolpage on the side of the scene, create toolbars containing single or grouped toolpages, leave toolpages floating.

Toolpages can be collapsed or expanded by clicking on the specific toolpage tab or by clicking on the option in the menu button.




A: tab – B: tab bar – C: menu button – D: scroll button

The menu button offers you few options to control the visibility of the toolpage:

- Pin: pinning a toolpage (or a toolpages group) automatically expands it. When pinned, a toolpage (or a group) can't be collapsed manually or automatically by the auto-collapse feature
  - This option is available only for docked toolpages
- Collapse/Expand: click this option to manually collapse or expand a toolpage
  - This option is available only for docked and floating toolpages
- Close: click this option to close the active toolpage. You can visualize again the toolpage by enabling its visibility via the Customize UI window (see Customize UI window on page 398 for more information)
- Close tab group: click this option to close the entire toolpages group. You can visualize again the toolpage by enabling its visibility via the Customize UI window (See Customize UI window on page 398 for more information)

When a toolpages group contains multiple tabs and these cannot be visualized all, a scroll button appears on the right side of the tab bar. Click to open a menu list of all toolpages present in the group and select the toolpage to activate.

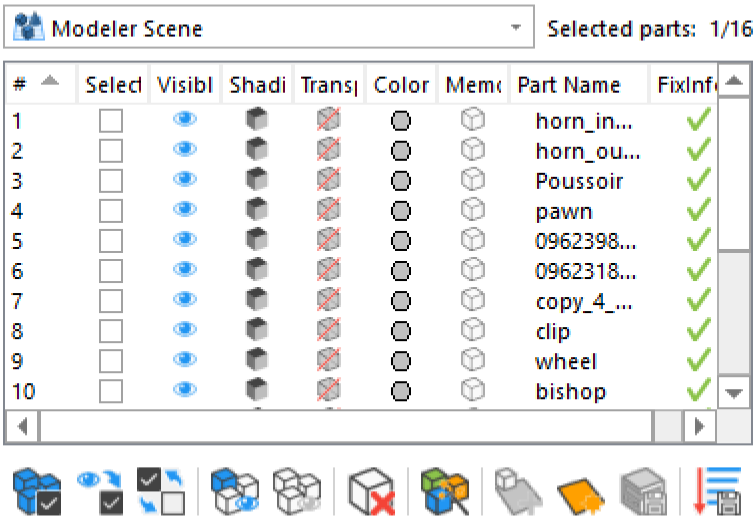
For some toolpages, Magics determines the height automatically (e.g. Part List or Surface List in the Support Generation module). This is dependent of:

- The space left over
- The space needed

## 16.1 General Pages

### 16.1.1 Part List page

The Part List Toolpage keeps track of the parts in the Part Scene and of the virtual copies in the Platform Scenes.




| | |
|---|---|
| Scene switcher | Drop down to switch between Modeler Scene and Platform Scenes. |
| Selected parts: | Number of selected parts / Total parts in the scene |

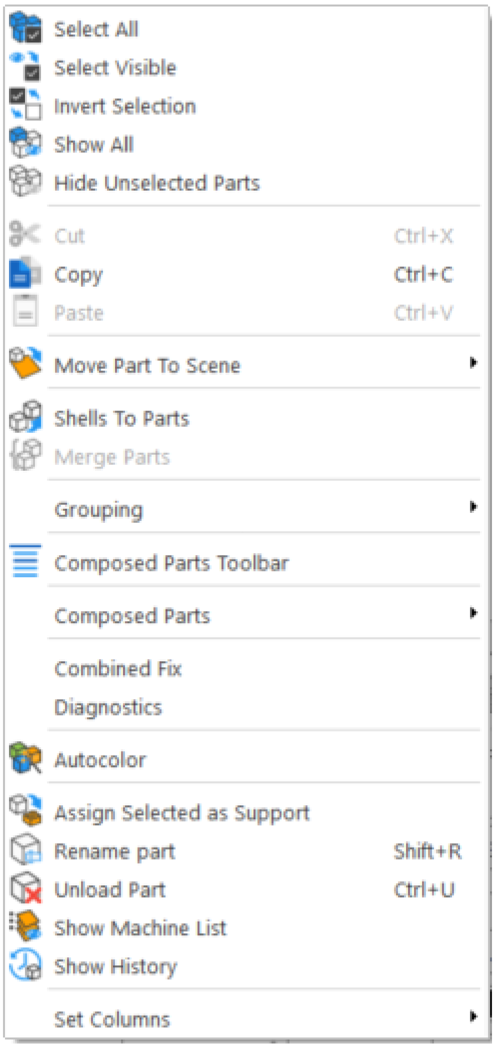
| | | |
|---|---|---|
| # | Number of the part. Can be used for ordering. | |
| Selected | When the checkbox of a part is checked, then the part is selected. | |
| Visible | Show/hide the part by clicking the “eye” icon. | |
| Shading | The user is able to define a separate visualization for each part. (Changing the visualization of a virtual copy on a Platform Scene will change the visualization of all virtual copies of the same mother part). | |
| | *Visualization mode of parts* | |
| | Hide | Hide the respective part. |
| | Shade | Shade will display the respective part with shades according to the direction of the triangles. |
| | Wireframe | Wireframe shows the edges of the respective part. |
| | Shade&Wire | The respective part is showed in a combination of the shade mode and the wireframe mode. |

| | | |
|---|---|---|
| | Triangle | The triangles of the respective parts will be displayed upon the shaded part. |
| | Bounding Box | This mode will only show the bounding box of the respective part. |
| | Transparent | This mode will show the respective part as transparent. |
| | No Shade | This mode shows the part without shading. |
| | *Visualization mode of slices* | |
| | Slices | |
| | Bounding Box | This mode will only show the bounding box of the respective part. |
| Transparency | Toggle the transparency of the part | |
| Color | The color in the circle represents the color of the matching part. Clicking this circle leads you to the material editor dialog or to the color palette. (Changing the color of a virtual copy on a Platform Scene will change the color of all virtual copies of the same mother part). | |
| Memory State | The user is able to define a separate memory state for every part. (Changing the memory state of a virtual copy on a Platform Scene will change the memory state of all virtual copies of the same mother part). | |
| | Compact | The STL resides in the memory as read-only; therefore it uses far less memory than the Standard memory state. Magics does not know the placement of the triangles nor the mutual dependencies of the triangles. The user is not able to perform actions on STL level. |
| | Normal | This is the standard memory state of a STL file. Magics knows the placement of the triangles and the mutual dependencies of the triangles. The user is able to perform actions on STL level (E.g. deleting triangles) |
| | On Disk | The STL is saved on disk and unloaded from the memory. The STL will stay in the project but the user can't perform any actions on it. |
| Part Name /Copy of | This column contains the names or the path of the loaded parts. In case of a Platform Scene, this column will show the name of the virtual copies. The name of a virtual copy is the same as the name of the mother part. If the name doesn't fit in the column a pop up, containing the full part name, will be shown when hovering over the name. | |

| | |
|---|---|
| FixInfo | This colums contains the fix status of the part. Double clicking on “n/a” will diagnose the part, double clicking again will perform an autofix on the part. |
| Extend with columns | Here you have the possibility to add or remove additional columns to the part list overview |

| | |
|---|---|
| Select All | Selects every part in the list. |
| Select Visible | Selects all visible parts on the current scene. |
| Invert Selection | All selected parts are unselected and the unselected parts are selected. The Invert Selected functionality works on the Selected (S) column. Invisible parts will thus become visible. |
| Show All | All invisible parts are made visible. |
| Hide Unselected | Hides all unselected parts. |
| Unload Selected Parts | Unloads all selected parts. |
| Auto Color | This button colors the parts as if they were newly loaded in Magics. |
| Add Part to Scene | This function is only available when a scene is present. A dialog pops up, showing the parts loaded in the Modeler Scene. Check the parts, from which you want to create a virtual copy on the active scene. |
| New Scene | The Select Machine dialog will pop up, where you can select the machine of the newly created Platform. |
| Export platform | This function is only available when a platform scene is loaded. It gives the possibility to export all loaded parts from Magics in one mouse click. |
| Save Order | Saves the new order of parts after drag ‘n dropping them in the list. |

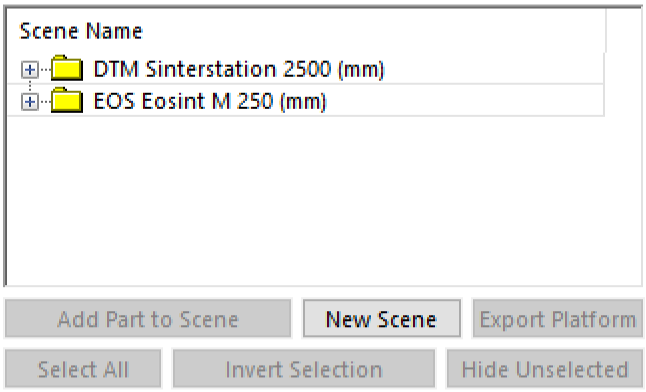
*Remark: When “Out of Bounds” is enabled, parts that are out of bounds will be also be marked in red in the Part List.*




| | |
|---|---|
| Select All | Selects every part in the list. |
| Invert Selection | All selected parts are unselected and the unselected parts are selected. The Invert Selected functionality works on the Selected (S) column. Invisible parts will thus become visible. |
| Show All | Visualize all parts |
| Hide Unselected | Hides all unselected parts. |
| Cut Part(s) | Selected virtual copies of a platform can be cut to the clipboard. |
| Copy Part(s) | The selected parts or virtual copies are copied to the clipboard. |
| Paste Part(s) | Parts are pasted from the clipboard in the active scene. |
| Shells to Parts | This function will split the selected parts, if they consist of more shells, into different parts. Now, each shell will represent one part. |
| Merge Selected Parts | The selected parts are merged into one STL. |

| | | |
|---|---|---|
| Grouping | The grouping functionality places parts in groups so that these are handled as one part for a number of operations. | |
| | Group | Create a group of selected parts |
| | Ungroup | All parts within the group become individual parts again. |
| | Remove from group | Remove selected parts from an existing group |
| Diagnostics | Runs Diagnostics | |
| Combined Fix | Executes the Combined Fix | |
| Autocolor | This button assigns random colors to the parts that are newly loaded in Magics. | |
| Unload Selected Parts | Deletes all the selected parts from the workspace. | |
| Rename part | Rename selected part(s). If multiple parts are selected, only same prefix and suffix will be added to the parts. | |
| Show history | Trace all steps performed of your part and platform in a history overview | |
| Set Columns | Pops up a sub menu where the user can define the visualized columns. | |
| | Show Part Name | Shows the part name of the parts. |
| | Show Path | Shows the path of the part in the Part Name column. |
| | # Triangles | Shows the amount of triangles used in the Part List. |
| | # Points | Shows the amount of points in the Part List. |
| | Surface | Shows the Surface of the parts in the Part List. |
| | Volume | Shows the Volume of the part in the Part List. |
| | # Invisible Triangles | Shows the amount of invisible triangles in the Part List. |
| | Preprocessed<br><br>Shading | Shows the Memory State of the part in the Part List.<br>Shows the visualization of the part. |
| | Wireframe angle | Shows the wireframe angle. |

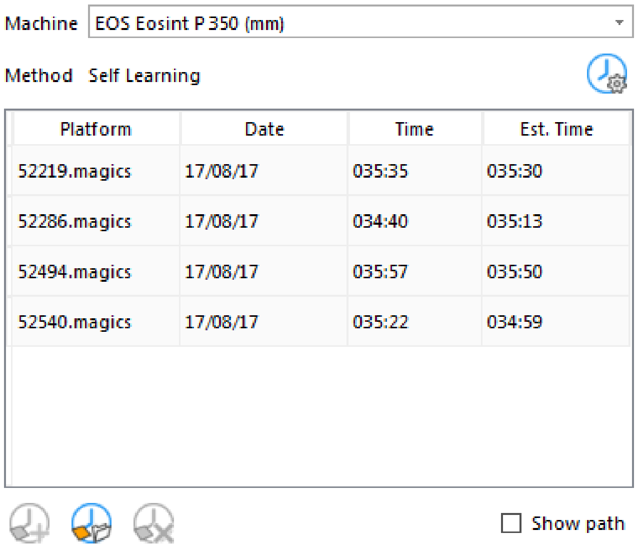
### 16.1.2 Scenes page



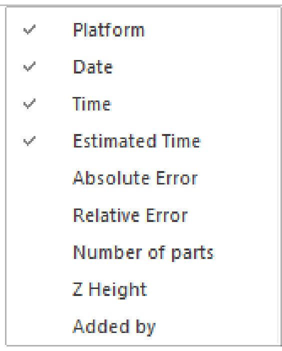

| | |
|---|---|
| Scene Name | All loaded scenes are displayed within a tree view. Below every scene you will find all parts loaded on that machine. |
| Add part to scene | This function is only available in the Platform Scenes. A dialog pops up, showing the parts loaded in the Modeler Scene. Check the parts, from which you want to create a virtual copy on the active Platform Scene. |
| New scene | The Select Machine dialog will pop up, where you can select the machine of the newly created Platform. |
| Export platform | Export all your parts/ copies to a chosen directory.<br>More information is found at the 'export platform' functionality. |
| Select All | Selects every part in the list. |
| Invert selection | All selected parts are unselected and the unselected parts are selected. The Invert Selected functionality works on the Selected (S) column. Invisible parts will thus become visible. |
| Hide unselected | Hides all unselected parts. |

### 16.1.3 Build Time Estimation page

The Build Time Estimation Toolpage keeps track of the settings for the build time estimation calculations; all machines stored in the My Machines library, including the Build Processor machines, are available in the toolpage.




| | | |
|---|---|---|
| Machine | This is a dropdown list containing all machines stored in the My Machines library. The machines are displayed following the priority assigned in the My Machines library. | |
| Method | The method chosen for build time estimation calculations is displayed. Click on the icon on the right side to edit the settings for the method chosen; the Machine Properties dialog will be automatically open. | |
| List of teaching platforms | The list is enabled only when the build time estimation method chosen is Self-learning. Here you can visualize and manage the data of your teaching platforms used for the build time estimation calculations. | |
| | Platform | The file name of the Magics project used as a teaching platform is displayed. |
| | Date | The value corresponds to the date when the teaching platform has been imported. |
| | Time | Insert the real build time of the teaching platform (hours and minutes). Double click on the field to edit the value. |
| | Estimated time | The value corresponds to the estimated build time of the teaching platform. |
| | Extend list with additional data | You have the possibility to add or remove additional columns; right mouse click on the list headers to display a list of additional columns. |

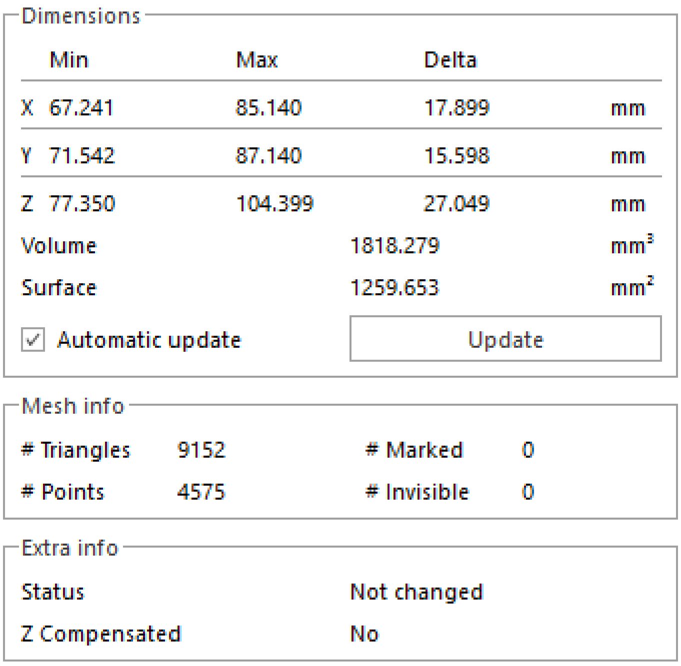
| | | |
|---|---|---|
| | |   |
| | Add current platform | Click on this icon to automatically add the current scene as a teaching platform. |
| | Import platform | Click on this icon to import a Magics project as a teaching platform. |
| | Delete platform | After selecting one or more teaching platforms from the list, click on this icon to delete the selected teaching platform(s) from the list. |
| | Show path | Select this option to display in the Platform column the file path instead of the Magics project file name. |

*Remark:* Teaching platforms that miss teaching information are displayed in red in the teaching platforms list.

## 16.2 Part Pages

### 16.2.1 Part Info page

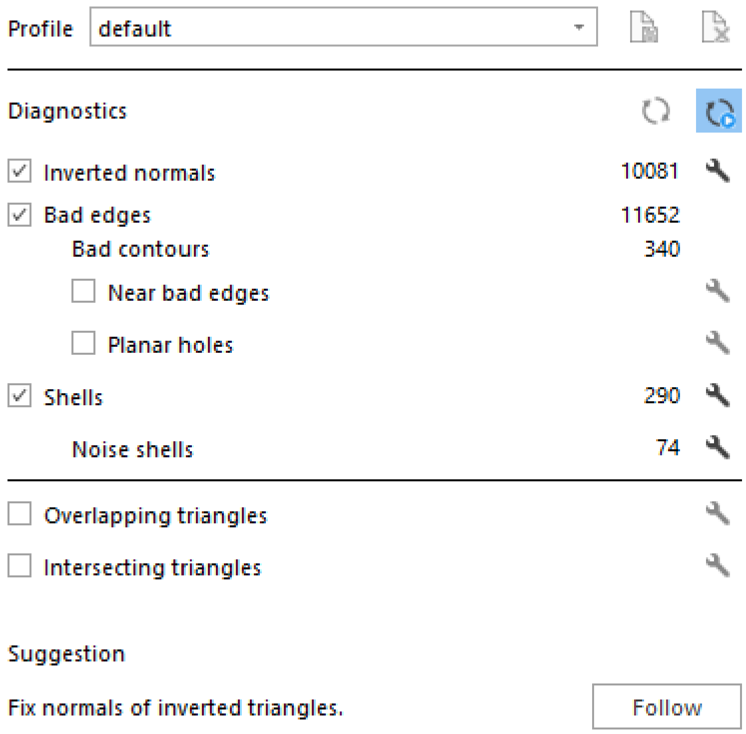
The properties of the parts in the Part List are displayed. All dimensions are displayed in the selected units. Select one part on the scene to visualize its part information on this toolpage.




| | | |
|---|---|---|
| Dimensions | The dimensions of the part. The minimum and maximum coordinates (X, Y, Z) of the part. The delta value is the difference between the minimum and maximum. | |
| | Volume | The volume of the part. |
| | Surface | The surface of the part. |
| | Automatic update | If checked, the Volume and Surface will be updated automatically. |
| | Update | Manually update all the information by clicking on this button; by default the Volume and Surface information has to be updated. |
| Mesh info | # Triangles | The amount of triangles of the part. |
| | # Points | The amount of points of the part. |
| | # Marked | The amount of marked triangles of the part. |
| | # Invisible | The amount of invisible triangles of the part. |
| Extra info | Status | The status of the STL-part. If no modifications are made to the loaded part, the status is Not Changed. In the other case, the status is Changed. |
| | Z Compensated | Indicates if the part is z-compensated or not. |

### 16.2.2 Part Fixing Info page

The Part Fixing Information Toolpage will guide you through the essential steps to fix a corrupt STL.




### *16.2.2.1 Diagnostics*

#### 16.2.2.1.1 Introduction

The Diagnostics section is the key-step in the part fixing process. In this step you can always determine what is wrong with the STL-file. Based on the Diagnostic, a suggestion will be given as a guideline through the fixing process.

#### 16.2.2.1.2 Advised way of working.

- Check the items you want to analyze
- You can auto fix the item by pressing the Fix button on the right.
- A Full Analysis will get you the best results
- Press the "Refresh" icon if the "Autorefresh" option is off
- The errors are shown
- Look at the "Suggestion" section: An advice is given on the available data.
- Items that are not checked are not taken in account to determine the advise
- Press the "Follow" button to perform the advised action.
- For the errors that cannot be fixed in this way, go to Fixing Pages to do a manual fix.

- See Fixing Pages, page 418.

#### 16.2.2.1.3 Tips and tricks

Change the advice

You can influence the advice with the check boxes. When unselecting a checkbox, the advice will not take this parameter in account. When Magics keeps on sending you to a certain fixing step, you can skip it this way.

Do I need a full analysis?

A full analysis is giving you the best result but consider that

- Each analysis takes time (especially the overlapping triangles and intersecting triangles)
- In the beginning you often do not need all information (especially the overlapping triangles and intersecting triangles)
- Depending for what you're going to use your STL-file afterwards, you may not need to repair intersecting and overlapping triangles.

### *16.2.2.2 Errors explained*

#### 16.2.2.2.1 Inverted Normals

In the STL format, a normal indicates the outside of a triangle. When the normal points to the wrong direction (the inside), the triangle needs to be inverted to have a watertight STL. This triangle is then called a flipped triangle.

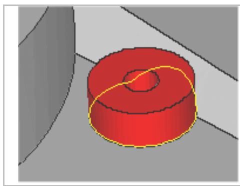
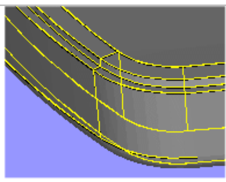
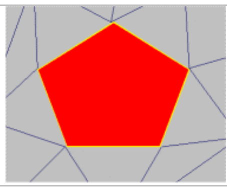
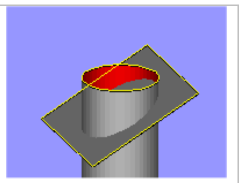
#### 16.2.2.2.2 Bad edges

To have a correct STL file, all edges of each triangle should be connected properly to a neighbor. If an edge is not connected properly, the edge is called a bad edge and is indicated with a yellow line. A group of connected bad edges will make a bad contour. The STL file will be sliced in a subsequent step. To process the slicefiles correctly, every slice needs to be closed. This is why Bad edges need to be fixed.

#### 16.2.2.2.3 Bad contours

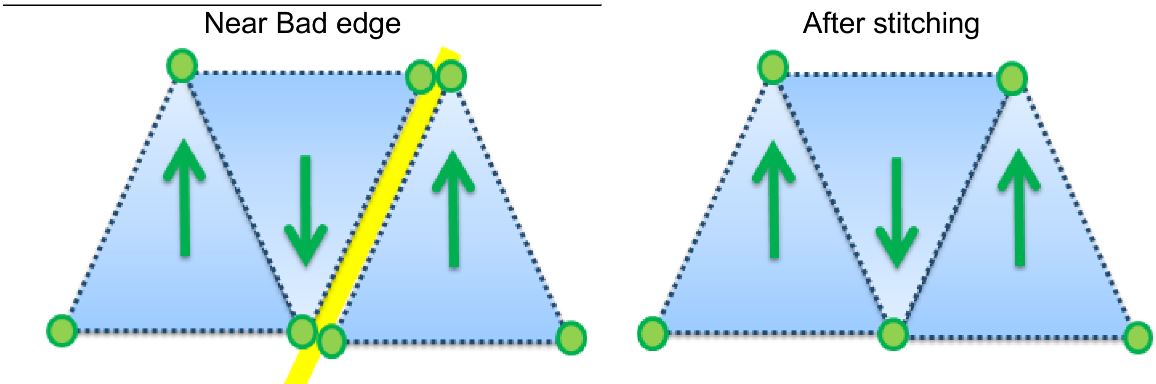
A group of bad edges connected to each other form a bad contour. E.g. the hole below has 1 bad contour that consists of 5 bad edges.

Some examples of common problems

| | | | |
|---|---|---|---|
|  |  |  |  |
| Flipped triangles | Near bad edges | Hole | Untrimmed triangles |

#### 16.2.2.2.3.1 Near bad edges

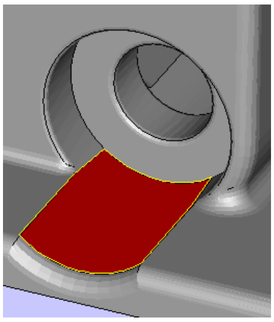
Near bad edges are bad edges that are near other bad edges. These are mainly caused by 2 surfaces that are not well connected. You can recognize them as long yellow lines on the part. You can fix them easily by stitching. Stitching is an automatic operation that will unite two neighboring triangles which both have a bad contour right next to each other.



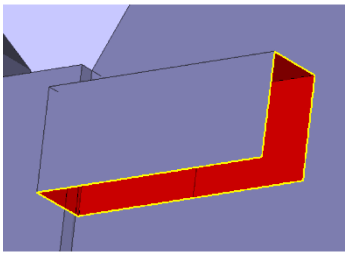

#### 16.2.2.2.3.2 Planar hole

A hole consists of missing triangles. Use fill hole to fill it up. Magics is only able to recognize planar holes, which are recognized by the open contour which lies more or less in one plane. Holes caused by more irregular contours will not be recognized by Magics and be shown as a bad contour.

Planar hole



Bad Contour



### 16.2.2.2.4 Intersecting triangles

Intersecting triangles are triangles cutting each other. It can happen sometimes that the STL surface has intersections. Depending of the application of the STL file, it's advised to remove the intersections. You can remove them with the Unify function on the Triangles Page.

- For Rapid Prototyping: This depends of your post processor. Normally, intersecting triangles are not a problem, however, some (older) slicers require a perfect shell without intersections.
- FEA: It is REQUIRED that there are no intersecting triangles.

### 16.2.2.2.5 Overlapping Triangles

An STL-file sometimes has overlapping triangles. These triangles can be removed with the tools in the double surfaces page.

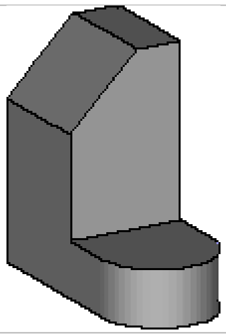
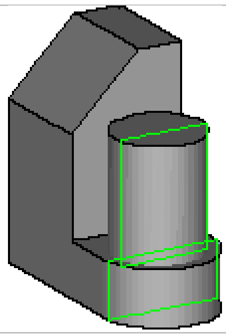
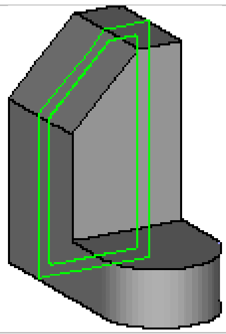
2 triangles are considered as overlapping as:

- The distance between them is smaller than the given tolerance. (E.g. 0,1 mm or 0,005 inch)
- The angle between the normal of the triangles is smaller than the given angle. (E.g. 5°)

Take into account that some "false alerts" may occur. When the triangles comply with the parameters, they will be marked as overlapping triangles, even when they are part of the geometry.

### 16.2.2.2.6 Shells

A shell is a collection of triangles connected to each other. Normally a part has only one shell because every triangle of the part is (indirectly) connected to every other triangle. Parts with:

| 1 shell | 2 shells | 2 shells |
| --- | --- | --- |
|  |  |  |
| Every triangle is connected to each other. | The cylinder is not connected properly to the part. The overlap between the two shells can cause build failure. This can be solved with a Unify. | The part is hollow. The inner shell is not connected with the outer shell. This is normal with hollow parts. |

#### 16.2.2.2.7 Noise shells

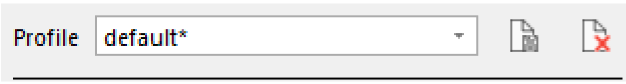
Some shells have no geometrical meaning and are considered as noise (waste) that we can throw away. However, it is recommended to look at these shells first before removing them. Even a shell of a few triangles can be important.

## 16.3 Fixing Pages

For all the possible errors, please see Errors explained, page 415.

### 16.3.1 Profiles

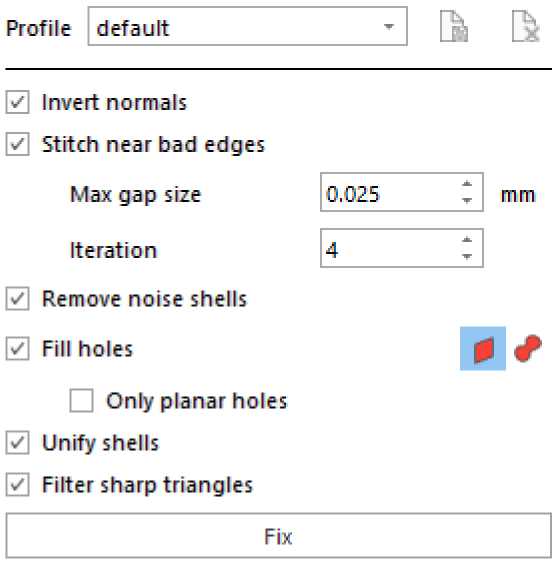
Maybe you're having STL's coming from different sources and for each "type" of STL file you need different settings for optimal fixing. With profiles, you can easily store your settings in profiles and load them again.




A default profile with default fixing parameters is always available for selection. This is called “default”. If any value of “default” is changed, this setup can be saved to a new profile.

If the parameters are modified while a profile is selected, this profile will be marked with a *. The changes will become permanent if the profile is saved again.

## 16.3.2 Autofix page



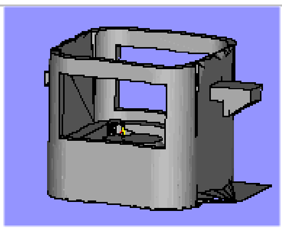
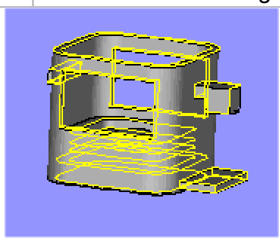
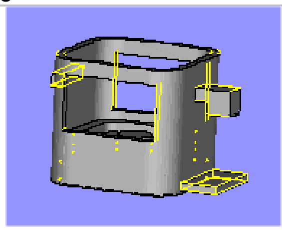

Here you can decide yourself what actions you want.

<table>
<tr><td>Invert normals</td><td colspan="2">Magics will reorient the normal of the triangles automatically.</td></tr>
<tr><td rowspan="3">Stitch near bad edges</td><td colspan="2">Two bad edges (yellow lines) which are close enough to each other can stitched automatically by pulling the open edges towards each other. This way, you get a watertight stl. As soon as the bad edges are too far apart (Tolerance parameter), stitching will deform the design and the bad edge is treated as a hole.</td></tr>
<tr><td>Max gap size</td><td>Here you indicate what distance a point may be moved to fix the near bad edge.</td></tr>
<tr><td>Iteration</td><td>To get better results, the stitching is done in iterations, starting with a small tolerance and ending with the given tolerance</td></tr>
<tr><td>Remove Noise Shells</td><td colspan="2">The automatic removal of detected noise shells, these noise shells make no geometrical sense.</td></tr>
<tr><td rowspan="3">Fill holes</td><td colspan="2">Magics will only fill a contour when it recognizes it as a hole. Some contours are not holes.</td></tr>
<tr><td>Only planar holes</td><td>Magics will only fill a contour when it recognizes it as a planar hole. Some contours are not planar holes.</td></tr>
<tr><td>Planar</td><td>The hole will be filled as a planar hole</td></tr>
</table>

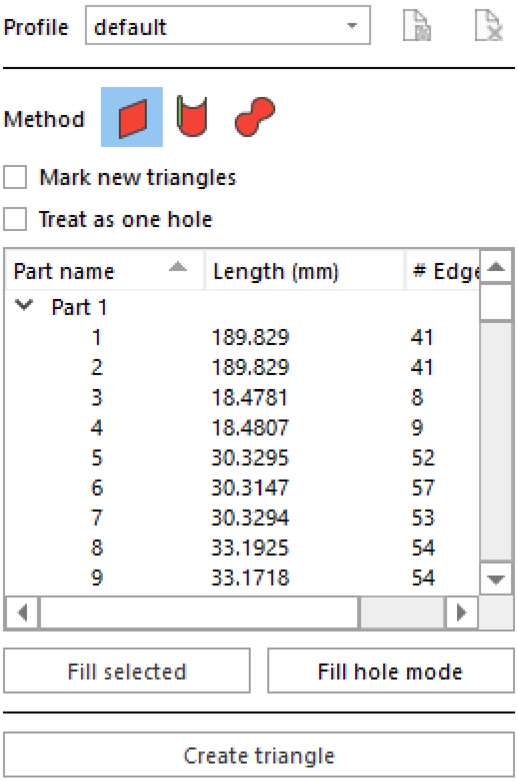
| | | |
|---|---|---|
| | Freeform | Complex shaped contours are better filled using the freeform algorithm.<br>Grid: The triangle size of the surface that is used to fill the contour |
| Unify shells | This will remove all internal geometry and intersecting triangles. This operation will only be done if the geometry allows it. | |
| Filter Sharp triangles | Sharp triangles will be removed to improve surface quality. | |

### 16.3.3 Near Bad Edges page


Magics will reposition points of triangles so that surfaces fit 100% correctly. For a Manual stitch, 2 parameters are needed

<table>
<tr><td>Max gap size</td><td colspan="2">The Stitch function will close gaps between all bad edges if the gap is smaller than this value. If the value is too small, not all near bad edges will be solved; if the value is too high, the geometry will be changed.</td></tr>
<tr><td>Iteration</td><td colspan="2">How many times the stitch algorithm should be applied. To avoid errors caused by high tolerances, Magics can stitch in iterations, starting with a stitch with a very small tolerance and ending with the given tolerance.</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Original file</td><td>Max gap size was too small. Still near bad edges visible</td><td>Max gap size was too high. Deformations of the part</td></tr>
</table>

## 16.3.4 Hole page

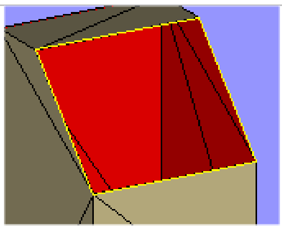
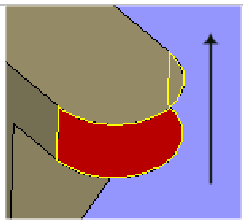
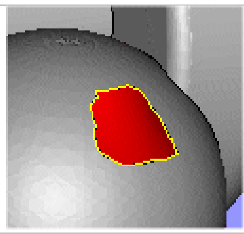



### *16.3.4.1 Introduction*

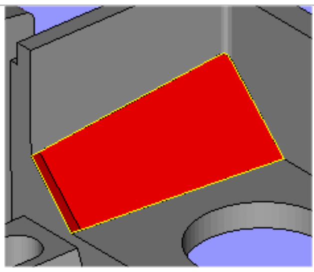
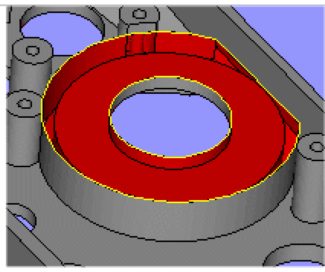
In some STL's some triangles are missing. A hole is in fact a special kind of bad contour: It's a bad contour with no triangles on the inside.

First you'll need to identify what kind of hole you're dealing with:

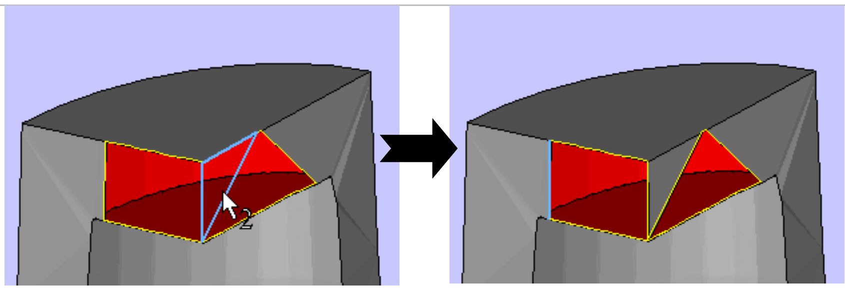
— Fill type

| Planar | Ruled | Freeform |
|---|---|---|
| A simple hole which can be solved automatically | For correct fixing, the user should determine a direction (or rule) how the hole should be fixed | A smooth surface will be generated to fill up the hole |
|  |  |  |

— Single or Multi-contour hole

| Single Contour | Multi – Contour |
|---|---|
| The hole is a simple hole, consisting of 1 contour | The hole consists of multiple contours that must be connected |
|  |  |

— Triangle creation

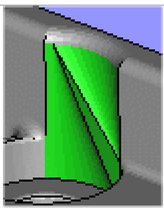
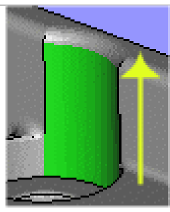
| Create triangle |
|---|
| By creating a triangle or a bridge, you can manually draw new triangle(s) which connect two bad edges. This way, complex holes can be subdivided more simple holes |
|  |

*16.3.4.2 Fill type*

*Planar:* Use this hole filling-type for simple holes. The hole will be filled as planar as possible, with respect to the shape of the contour

—

*Ruled*: Use this hole filling for holes that shouldn't be filled as planar as possible but where the triangles should be positioned parallel to a certain direction. This extra indication of the "filling direction" helps Magics to understand the geometry and has to be indicated manually.

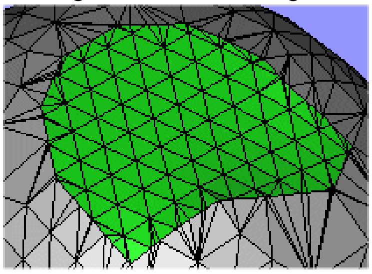
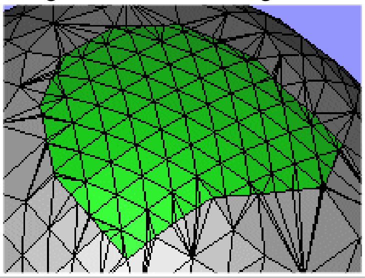
| Planar hole fill | Ruled hole fill |
|---|---|
|  |  |

Filling direction: In what direction the triangles have to cross the hole to fill the hole correctly.

- You can select the X, Y or Z direction
- Select User defined option and click on Indicate line button to indicate a line on the wire-frame or a bad edge as filling direction

*Freeform:* For freeform hole filling, Magics will put a grid of triangles in the bad contour to ensure a fluent surface.

- Grid size: the size of the triangles
- Automatic: When Automatic is switched on, the generated grid wil be generated according to a selected setting between Very coarse and Very fine.
- Tangent: When Tangent is switched on, the generated surface hole fits perfectly on the surrounding triangles.

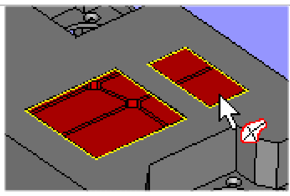
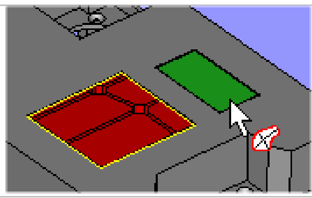
| Non tangent to surrounding surface | Tangent to surrounding surface |
|---|---|
|  |  |

### *16.3.4.3 Single or Multi-contour hole*

*Single Contour*

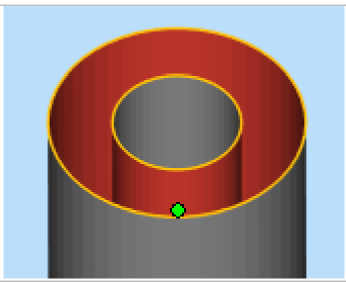
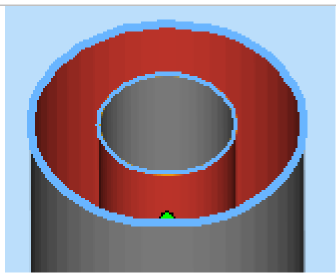
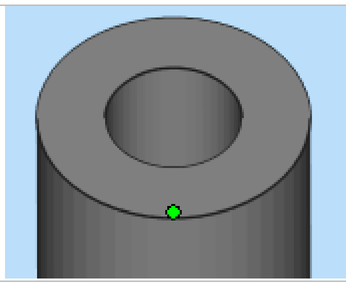
The easiest way to fill Single Contour holes is to use the “Fill hole mode”.

- Be sure you choose the right hole filling mode (Planar, Ruled or Freeform)
- Go with the cursor to the bad contour of the hole and click.
- New triangles will be created automatically to fill up the hole.

| | |
|---|---|
|  |  |
| Go to the bad contour in hole filling mode | Click and the contour is filled |

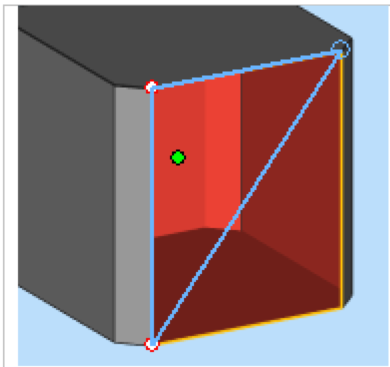
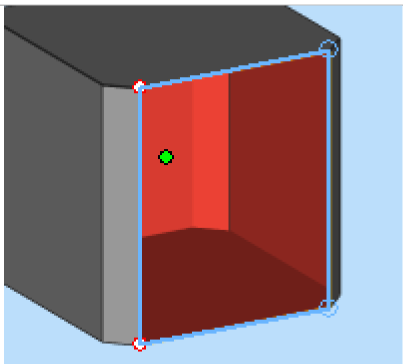
*Multiple Contour*

To fill Multi Contour holes, the combination of ‘Fill hole mode’ and ‘Treat as one hole’ functionality might be used. This command uses the selected contours to close the gap in between the different contours.

| | | |
|---|---|---|
|  |  |  |
| This is the multi contour hole | Select the contours that are part of the hole with “Fill hole mode” and “Treat as one hole”option on. | The hole is filled automatically. |

### *16.3.4.4 Create triangle*

The create triangle function is used to help fixing complex holes. With a selection of point(s) or edge(s), triangle or bridge could be created.

| | |
|---|---|
|  |  |
| Triangle is created with a selection of 3 vertices (or 1 edge and 1 vertex). | Bridge is created with a selection of 2 edges. |

### *16.3.4.5 Tips and tricks*

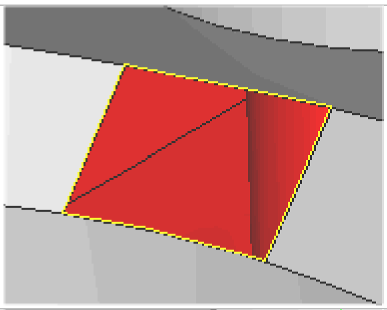
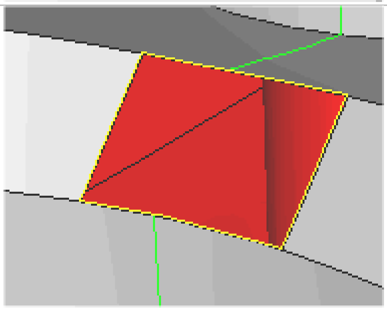
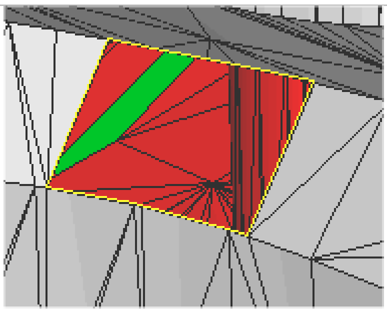
#### 16.3.4.5.1 The force of Planar Holes

You'll be amazed how many non-planar holes the Planar Hole filling can handle. Because the Planar Hole filling is very fast, it does not harm to try to fill the hole with a Planar Hole filling first. If it's not ok, use "undo".

16.3.4.5.2 Auto Multiple Contour hole filling

When filling a single hole and Magics finds another contour in the inside of the bad contour, Magics supposes that the hole is in fact a multi contour hole. He will propose to use the found contour and perform a multi contour hole.

- *How to recognize a hole?*

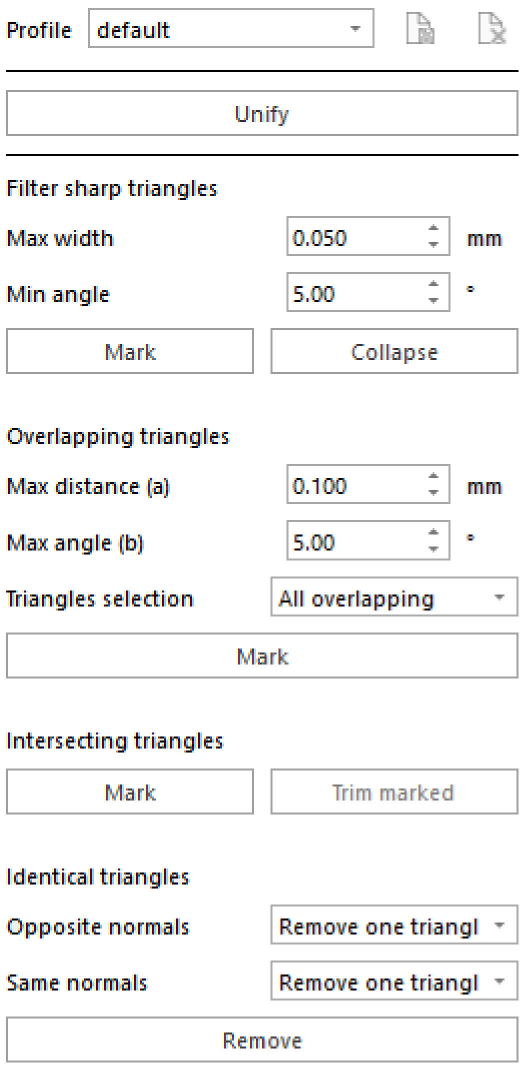
| | |
|---|---|
|  | You can see the inside geometry through the hole. You will see the other side of the part |
|  | When taking a section through the hole, there's no line drawn in the hole |
|  | In triangle view, the triangles on the other side are not triangular. The marked triangle is not triangular |

- *Use the hole list to find holes.*

| Part name | Length (mm) | # Edges |
|---|---|---|
| 1 Bad | | |
| 1 | 189,829 | 41 |
| 2 | 189,829 | 41 |
| 3 | 18,4781 | 8 |
| 4 | 18,4807 | 9 |
| 5 | 30,3295 | 52 |
| 6 | 30,3147 | 57 |
| 7 | 30,3294 | 53 |
| 8 | 33,1925 | 54 |
| 9 | 33,1718 | 54 |

In this list all the holes are shown. You can sort them by clicking on the column headers. You can select holes by clicking on them in the table, and zoom into them by double clicking.

### 16.3.5 Triangle page

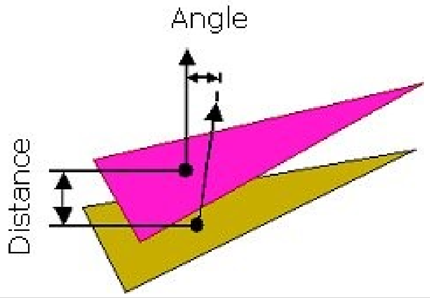



#### *16.3.5.1 Filter Sharp Triangles*

| | | |
|---|---|---|
| Max width | Triangles thinner than this distance will be marked or removed, depending on your choice. | |
| Min angle | The thin triangle will only be selected when the angle it makes with its neighbors is bigger than the given angle. This is easy to filter only thin triangles of folds and leave thin triangles of curves untouched. | |
| Action | Collapse | The thin triangle will be removed and its neighbors will be connected to each other. |
| | Mark | The thin triangles will be marked. |

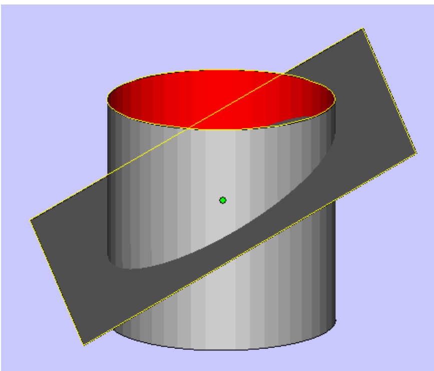
### 16.3.5.2 Overlapping triangles

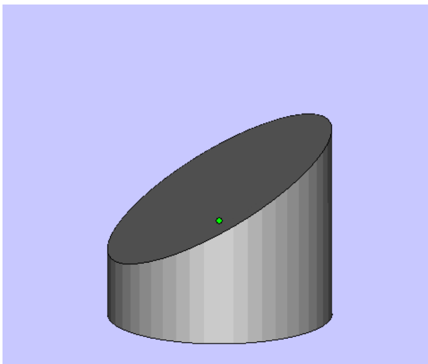
Overlaps (causing double surfaces) must be removed for some applications (E.g. Milling or FEA).

<table>
<tr><td colspan="2">Max distance</td><td>The maximum distance between two triangles (surfaces) in order to be considered as double triangles (surfaces).</td></tr>
<tr><td colspan="2">Max angle</td><td>If two triangles are inclined more than this angle, they are considered not to be double triangles.</td></tr>
<tr><td colspan="3">
</td></tr>
<tr><td rowspan="3">Triangles selection</td><td>Opposite normals</td><td>Triangles with their normal in the opposite direction.</td></tr>
<tr><td>Same normals</td><td>Triangles with their normal in the same direction.</td></tr>
<tr><td>All overlapping</td><td>Opposite normals and Same normals</td></tr>
</table>

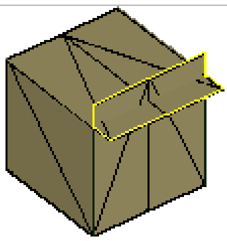
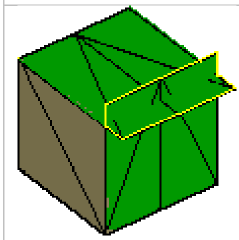
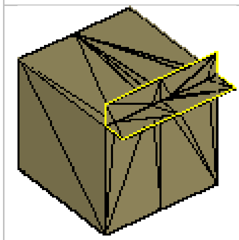
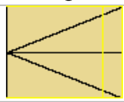
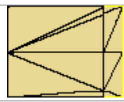
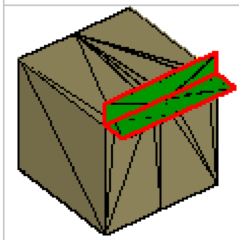
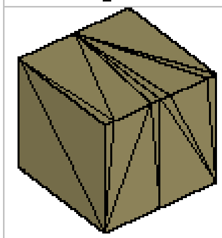
### 16.3.5.3 Intersecting triangles

To solve the bad edges that are still left, more creative fixing is needed. Some possible errors you can still encounter are trimmed surfaces. In this case, a surface is sticking outside of the design and needs to be cut off (see picture below)



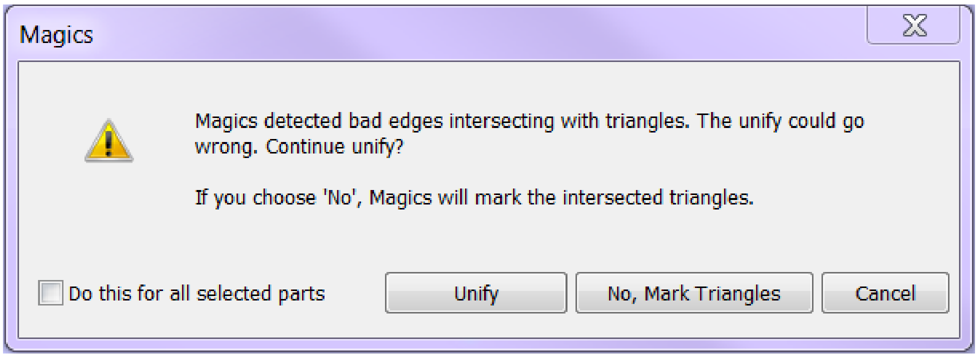


| | |
|---|---|
| Unify | This will remove self-intersections and trim surfaces automatically. It's not advised to continue when a bad edge is intersecting a triangle because it will produce a corrupt part. |
| Trim marked | This will trim the marked triangles |

| | | |
|---|---|---|
| |  | 2 surfaces on this cube are not trimmed correctly. They are too long and intersecting. You can detect these intersections with the button detect intersecting. |
| |  | Mark the triangles that you want to trim |
| |  | Press Trim marked, the triangles are re-triangulated so there's an edge on the intersection line.<br> Before<br> *After* |
| |  | Mark the triangles you do not need anymore and delete them. |
| |  | The result. |

- Tips and Tricks

*What does the message: "Magics detected bad edges intersecting with triangles. The Unify could go wrong. Continue Unify?" mean?*



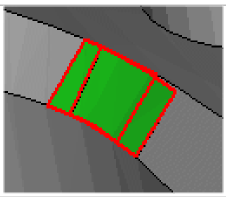
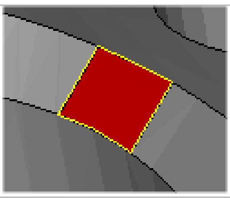
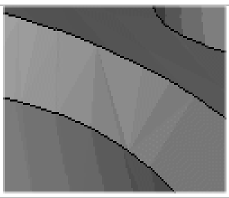
The Unify function won't have a good result if a bad edge is intersecting a triangle. Try to manually remove the bad edges that are intersecting the triangles. There are multiple ways doing this:

- Continue anyway the Unify

However it can damage your part, you can always try to continue. Sometimes the damage can be solved very easily with filling up the holes. Sometimes you'll need to undo and use an alternative way

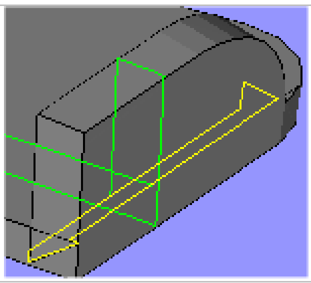
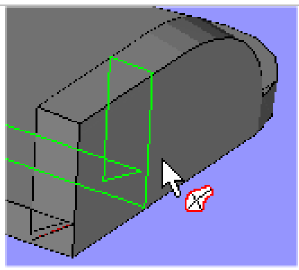
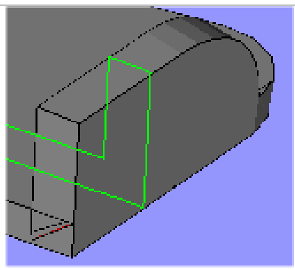
- By making a hole

Delete triangles so that the bad contour becomes a hole that you can fill. Trim marked can help here to re-triangulate the intersecting triangles so you can minimize the surface you need to delete

| | |
|---|---|
|  |  |
| This is the intersection | Mark all the triangles that are involved in the problem |
|  |  |
| Create a hole by deleting the marked triangles | Fill the hole with the hole filling functions |

- By closing the bad contour

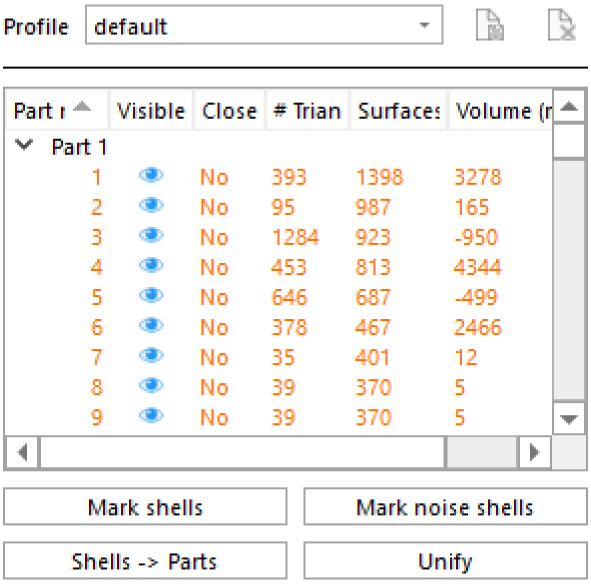
Fill the bad contour as if it was a hole. (A Freeform Hole fill will fill almost all bad contours). The internal geometry can be removed with Unify.

| | | |
|---|---|---|
|  |  |  |
| This is the trimming error. | With a fill hole the contour is filled with triangles | After a Unify, the internal geometry is gone. |

### *16.3.5.4 Identical triangles*

| | |
|---|---|
| Opposite normals | The triangles have their normal in opposite directions. When you check this box, only the identical ‘opposite’ triangles are removed.<br>You can choose to leave one of the two triangles or remove them both. |
| Same normals | The triangles have their normal in the same direction. When you check this box, only the identical triangles are removed.<br>You can choose to leave one of the two triangles or remove them both. |

## 16.3.6 Shell page



#### 16.3.6.1 Introduction

It can happen that your part consists of multiple shells. Use this tool to manipulate the shells. Because this is not really an error, there's no automatic way to solve this problem.

#### 16.3.6.2 In detail

— Shell list

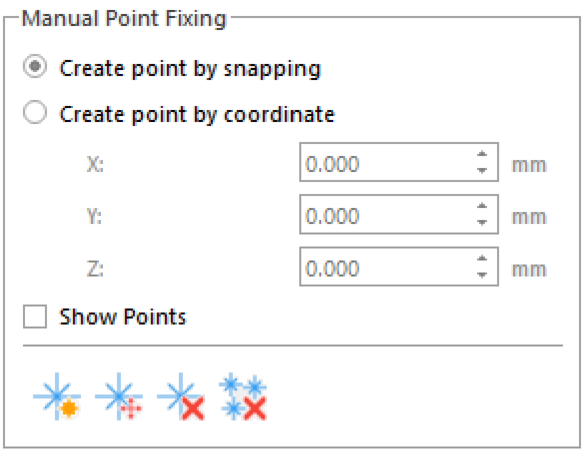
In this list all the shells are shown. You can sort them by clicking on the column headers.

You can select shells by clicking on them in the table. To easily find the shells on your part, double click the items from the list. Shells can be quite small and therefore make it difficult to find them.

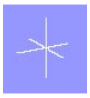
— Actions

| | |
|---|---|
| Mark noise shells | The noise shells will be selected. |
| Unify | This will remove self-intersections and trim surfaces automatically. It's not advised to continue when a bad edge is intersecting a triangle because it will produce a corrupt part. |
| Shells - > Parts | This will make a part of each shell. |

### 16.3.7 Point page

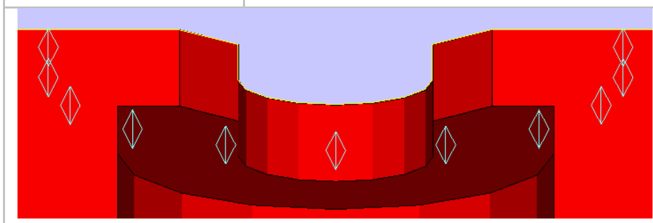


### *16.3.7.1 User points*

 The user creates user points by using the Create button. The coordinates you need to create those points can be retrieved from the info box in the measuring Toolpage (these values are copy-pasteable via the right mouse button)

### *16.3.7.2 Free points*

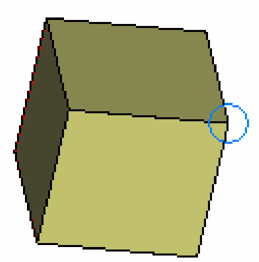
 These points are created when all the triangles, which are using this point, are deleted. When all these connected triangles are deleted, Magics will keep the points so you can use them again later.

| | | |
|---|---|---|
| Manual Point Fixing | Show Points | Check this to show the currently present points. You can only see and use the points in Magics when they are visible |
| |  | |
| | X – Y – Z | Use these fields to enter the coordinates of the newly created point. |
| | Add point | A new point will be created using the given coordinates |
| | Delete point | Select points manually to remove them |
| | Create new point | Add new points manually on a surface |
| | Delete all points | All present points are removed |

To snap to these points the following selection has to be made in the settings overview of Magics: “Points with Triangles” & “Points without Triangles”. This can be activated via Options – Settings – General – Snapping.

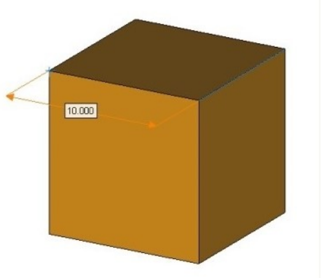
## 16.4 Measurements pages

Magics recognizes different features: a point, a line, a plane, a circle, a cylinder and a sphere. You select a feature by moving the pointer of the mouse. Magics will snap (the feature will be marked when you move over it) to all features of the type you selected. For example points - see figure - are marked with a round. In the Settings you can choose which features Magics should recognize. You may for example determine that you only want to snap to points that are in a section, or on a wireframe…

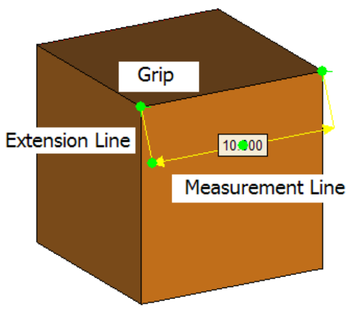


By clicking the left mouse button, you will select the marked feature. When all features of the measurement are selected, they will be marked if the draw feature in the measurement part of the settings is checked.

For example a point is indicated with a cross (see figure), a line with a line (see figure), and a sphere with 3 circumpolar circles. When the draw feature in the measurement part of the settings window is not on, the feature may be selected but is not indicated in a special way.




To select a measurement, you click on the icon ‘select parts’ in the main toolbar ( ) or in the measurement Toolpage. The mouse pointer gets a green round to show you are in the selection mode. Click on the measurement value to select the measurement. When the measurement is selected some grips will appear. In the figure, the measurement with value 10 is selected. There is a grip in the middle of the measurement line and on one of the intersections of the extension line with the measurement line.



It is possible to adapt a measurement by dragging one of the feature indicators to a same feature positioned elsewhere on the part. This way you get a new measurement. To do so you first have to select a measurement.

In the Settings window, you can indicate how you would like to display the measurement (with or without arrows and extension lines, the size of the grips….).

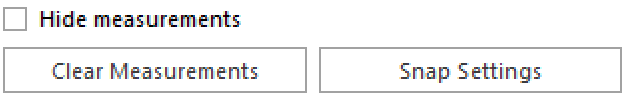
If you are not satisfied with the position of the measurement value on the screen, you can change this position. First, select a measurement with the mouse. If you select the grips at the cross points of the extension lines, you can turn the measurement indication line around the axis that connects the selected features. When you select the grip in the middle of the measurement line, you can make the extension lines longer or shorter.

Selected measurements can be deleted with the Delete button on the keyboard.

To delete one or more measurements (but not all), one has to follow these two steps:

- Select the dimensions you want to delete (keep the shift button down to select several dimensions)
- Hit the Delete button on the keyboard.

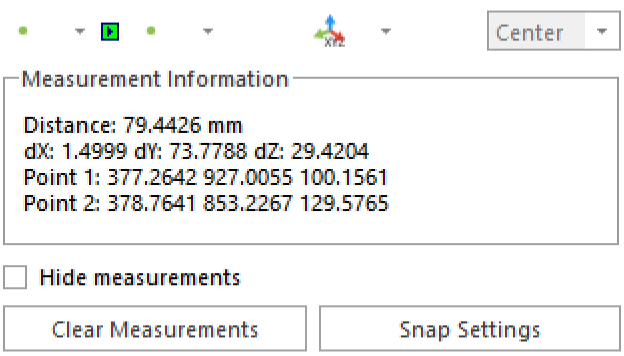
All measurements can be deleted at once by clicking the Clear Measurements button in the respective Toolpage.

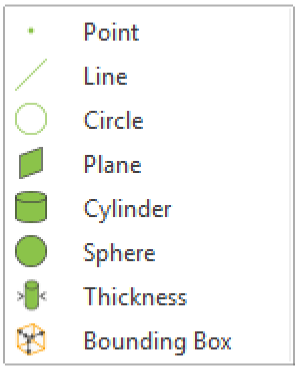



| | |
|---|---|
| Hide measurements | When checked, the made measurements are hidden. Uncheck to see the measurements. |
| Clear Measurements | Deletes all measurements. |
| Snap Settings | Brings you to the Settings window. You can indicate how you would like to display the measurement. |

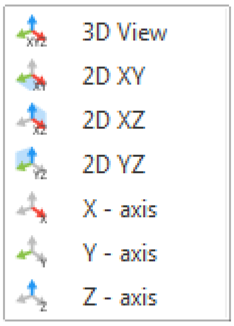
### 16.4.1 Distance page

The Distance Toolpage allows you to measure the distance between several features.






| *Feature* | *Measurement Description* |
|---|---|
| Point | The length from the second feature to the point. |
| Line | The length of the perpendicular through the second feature on the line. |
| Circle | The length of the perpendicular through the second feature on the circle. |
| Plane | The length of the perpendicular through the second feature on the plane. If you select a plane, Magics will snap to a triangle in that plane. |
| Cylinder | The length of the perpendicular through the second feature on the middle line of the cylinder. |
| Sphere | The length from the second feature to the center of the sphere. |
| Thickness | Measuring thickness is a special way of measuring: you do not have to select a second entity. When clicking on the part, Magics will measure the distance perpendicular on the triangles surface through the inside till it reaches another triangle (=the other side of the part). When measuring thickness, the snapping on the STL-surface is switched on automatically. |
| Bounding box | Measures the bounding box of the indicated part. |




| *Snapping restrictions* | |
|---|---|
| 3D View | The measurement is allowed in 3D |
| 2D XY | The measurement is restricted to the 2D XY plane. |

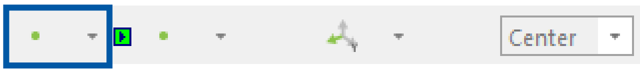
| | | |
|---|---|---|
| 2D XZ | The measurement is restricted to the 2D XZ plane. | |
| 2D YZ | The measurement is restricted to the 2D YZ plane. | |
| X-axis | The measurement is restricted to the 1D X axis. | |
| Y-axis | The measurement is restricted to the 1D Y axis. | |
| Z-axis | The measurement is restricted to the 1D Z axis. | |
| Circle options | Center | The center of the circle is used as a starting/ ending point of the measurement. |
| | Inside | The inside of the circle is used as a starting/ ending point of the measurement |
| | Outside | The outside of the circle is used as a starting/ ending point of the measurement. |

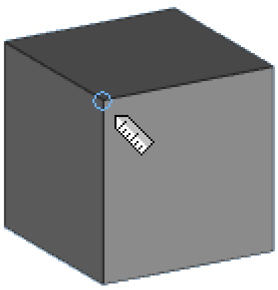
_Remark_: The measurement is dynamic: When you have selected the first feature, Magics will look for the second feature as you move your mouse over the part. The measurement value will change as you snap to features at different positions.

### *16.4.1.1 Advised Way of Working*

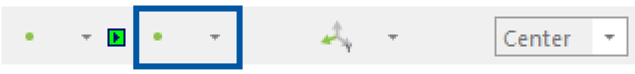
— Choose the restriction of the measurement. This is possible in 1, 2 or 3 dimensions.

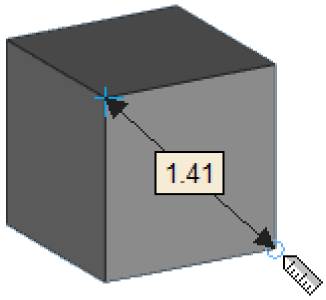

— Choose the first feature in the menu (by clicking on it), snap the feature on the part and click on it to select it.



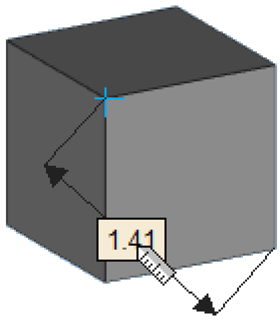



— Choose the second feature in the second menu (by clicking on it) and snap to the feature on the part and then click on it to select it.



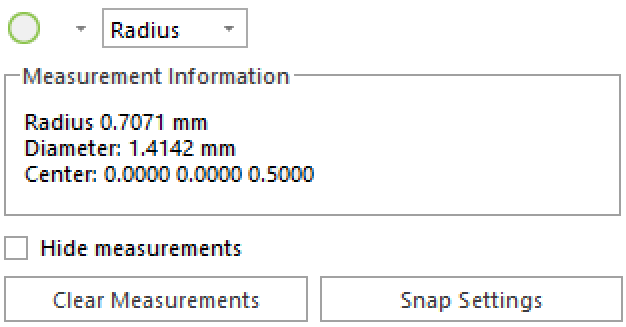


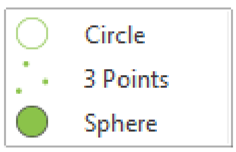

— Choose where you want to display the measurement on the screen, by dragging the extension lines of the measurement.




— When you click a last time, the measurement will be fixed.

## 16.4.2 Circle page

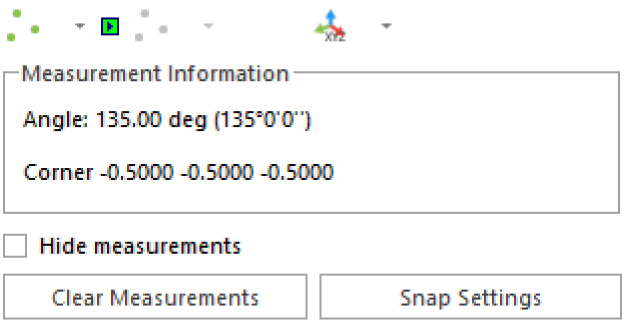


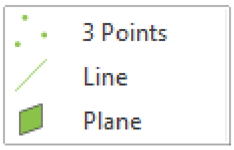




| *Feature* | *Measurement description* |
|---|---|
| Circle | Select an arc. The radius (or diameter) of the arc will be displayed. |

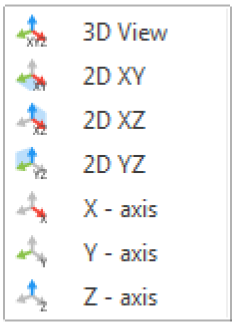
| | |
|---|---|
| 3-Points | Select three points. The radius (or diameters) of the circle defined by these three points will be displayed.<br>Be aware that it is possible to indicate three random points. This can result in a non-existing arc! It is advised to use the radius of an arc measure function when possible. Use this function only when the arc is not recognized by Magics as a feature. |
| Sphere | Select a sphere. The radius (or diameter) of the sphere will be displayed. |
| Radius or Diameter | You can choose whether you want to measure the radius or the diameter. |

### 16.4.3 Angle page



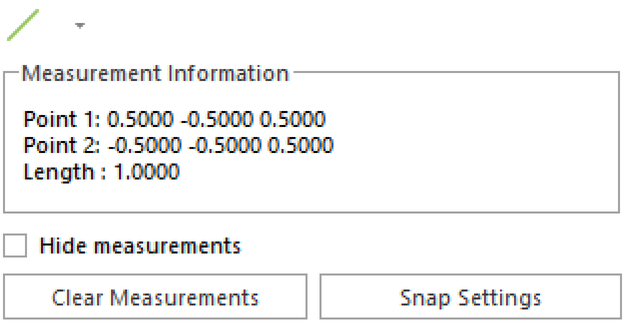




| *Feature* | *Measurement Description* |
|---|---|
| 3 points | Select three points. Two imaginary lines will be drawn between those points: between points 1 and 2, and between points 2 and 3. The resulting angle is the angle between those two lines defined by the three points. (You only have to use the 'from side').<br>Remark: It is advised to measure the angle between two line features when possible. Only use this function when the lines can't be recognized by Magics as features. |
| Line | Select the two intersecting lines. Both lines will be highlighted, and the intersection point will be drawn. The resulting angle is the angle between those two lines. |
| Plane | Select two planes. |
| Defaults | You can also measure the angle between a line or plane and an axis or plane of the coordinate center. |




| Snapping restrictions | |
|---|---|
| 3D View | The measurement is allowed in 3D |
| 2D XY | The measurement is restricted to the 2D XY plane. |
| 2D XZ | The measurement is restricted to the 2D XZ plane. |
| 2D YZ | The measurement is restricted to the 2D YZ plane. |
| X-axis | The measurement is restricted to the 1D X axis. |
| Y-axis | The measurement is restricted to the 1D Y axis. |
| Z-axis | The measurement is restricted to the 1D Z axis. |

### 16.4.4 Info page



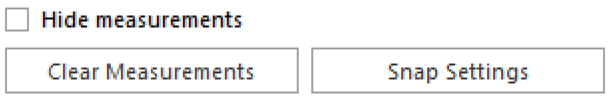

When you snap to a feature, or you select it, some coordinate information of the features is given. This information allows you to draw exactly the same feature on the same point in space.

| | |
|---|---|
| Point | The X, Y and Z coordinate of the point will be displayed. |
| Line | The X, Y and Z coordinate of the beginning and end points will be displayed, together with the length of the line. |
| Circle | The X, Y and Z coordinate of the center of the circle is given, together with its radius. |
| Triangle | The X, Y, Z coordinates of the corner points and the direction coefficient of the normal will be displayed. |

| | |
|---|---|
| Cylinder | The X, Y and Z coordinate of the middle point of the bounding discs is given, together with the radius. |
| Sphere | The X, Y and Z coordinate of the middle point of the sphere is given, together with its radius. |
| Section | The Length and surface of the selected contour is given. |

## 16.4.5 Final Part page

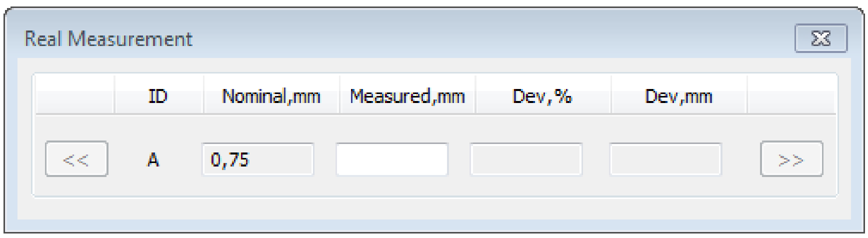
Within the final part Toolpage real life measurements of the part, can be added next to the measurements made in Magics.


| | |
|---|---|
| Add real measurements | Add measurements made in real life to the existing ones in Magics to compare them. |
| Measurements quality | Brings you to the measurements quality settings where you can adjust the used tolerance. |

### *16.4.5.1 Add real measurement*

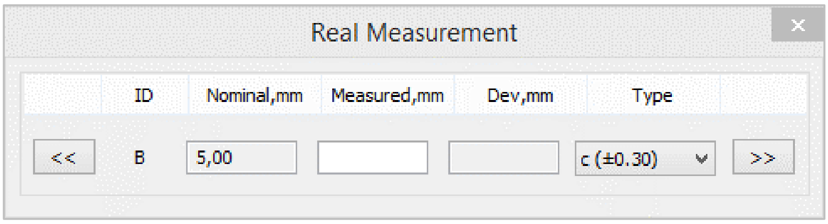
#### 16.4.5.1.1 Basic measurement quality




| | |
|---|---|
| ID | Every measurement is indicated by a unique ID |
| Nominal, mm | Displays the value of the active measurement, measured in Magics |
| Measured, mm | Enter the real life measurement which matches the one in Magics |
| Dev, % | Shows the deviation in percentage between the measurement made in Magics and the one in real life. |

| | |
|---|---|
| Dev, mm | Shows the deviation in millimeters between the measurement made in Magics and the one in real life. |
| Browsing buttons | Navigate easily between the different measurements |

### 16.4.5.1.2 Advanced measurement quality




| | |
|---|---|
| ID | Every measurement is indicated by a unique ID |
| Nominal, mm | Displays the value of the active measurement, measured in Magics |
| Measured, mm | Enter the real life measurement which matches the one in Magics |
| Dev, mm | Shows the deviation in millimeters between the measurement made in Magics and the one in real life. |
| Type | Choose the type of deviation. This is based on the selected measurement profile within the settings. |
| Browsing buttons | Navigate easily between the different measurements |

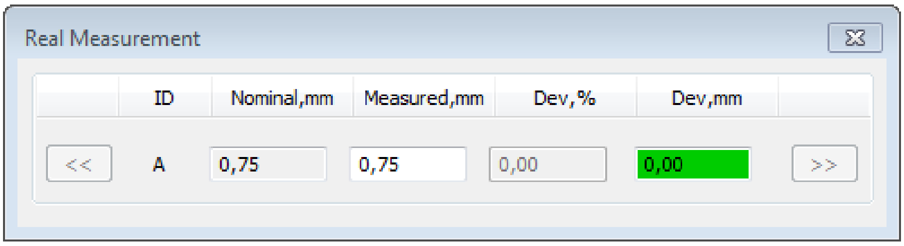
*Remark*: Via ‘Settings’ > ‘Measurements’ it can be defined which measurement quality is used.

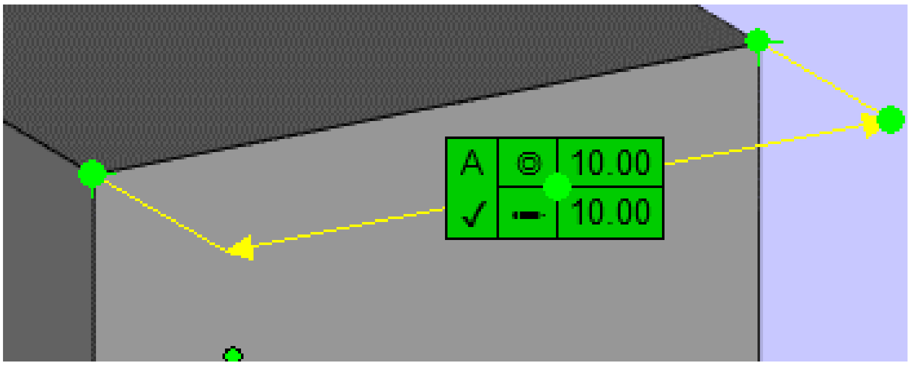
### *16.4.5.2 Analyzing measurements (Showing basic measurement quality)*

There are 3 possible outcomes after entering the real life measurements to Magics.

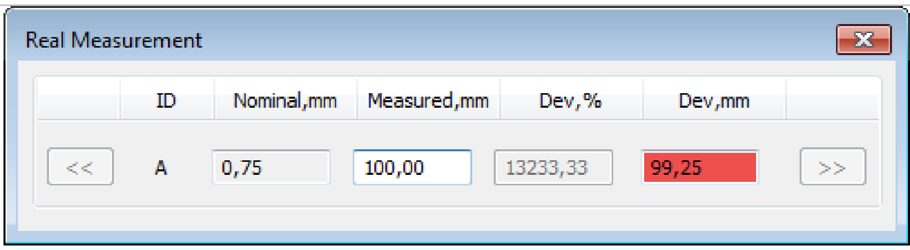
Depending on the defined tolerance in the settings, the measurements will get one of the following color codes. (Default are ‘Relative tolerance (Dev,%) = 0,3%’; ‘Absolute tolerance (Dev, mm) = 0,2mm)

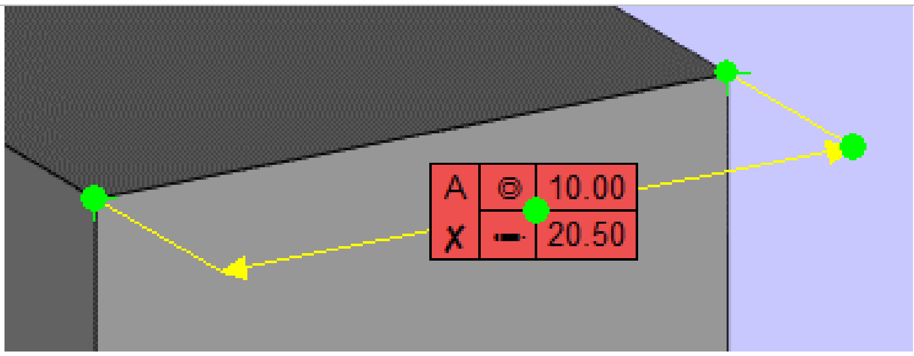
Green = Dev, % < 0.30% and Dev, mm < 0.2mm



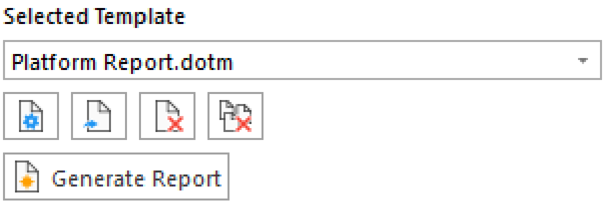

Red = Dev, % > 0.30% and Dev, mm > 0.2mm




### 16.4.6 Report page

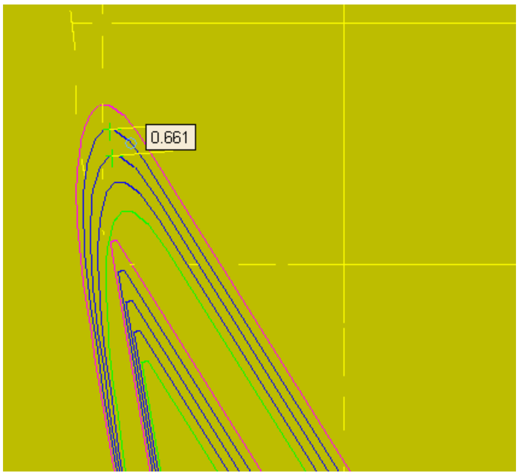
The Report Toolpage allows you to generate a measuring report.




| | |
|---|---|
| Selected Template | The template you've selected. |
| Create report template | Create a customized template report. A 'start here' template is available to start from. |
| Load report template | Load an available template. |
| Remove selected template from the list | Erases the selected template |
| Clear template list | The entire template list will be erased. |
| Generate report | Create the actual report |

### 16.4.7 Measurements on slices

Once parts are viewed as slices, measurements can also be made on them. All available measurement tools can be used to measure.

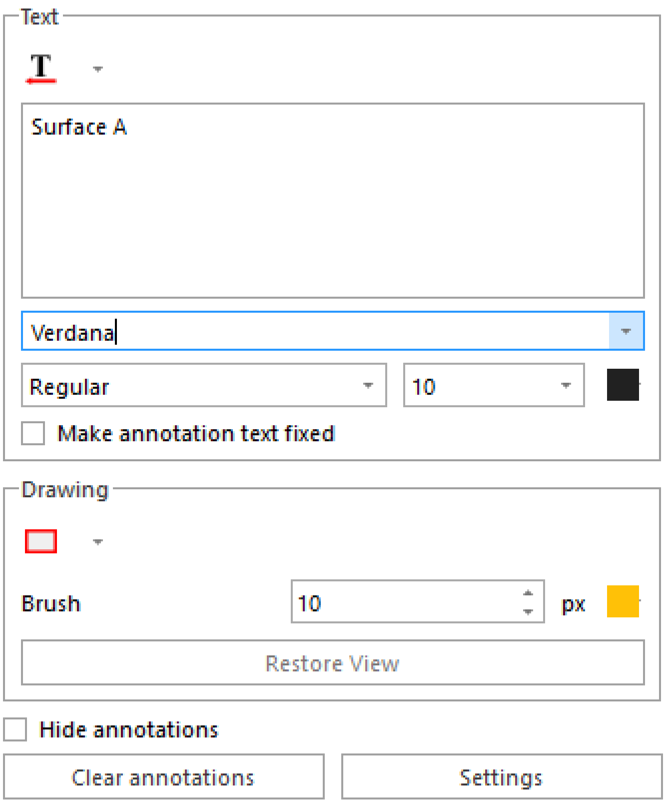


## 16.5 Annotation Pages

Adding extra information to the *.magics project has never been so easy. Now, it is possible to add texts and drawings; files can be attached and textures can be printed on parts. For keeping a well-organized overview of your project, working with annotation scenes is advised.

### 16.5.1 Annotations page

The Annotations Toolpage makes it easy to add a text to the Magics project or to draw in the active scene.




— Text section

| | |
|---|---|
| Text dropdown | Choose between adding a simple textbox or a referring textbox with an arrow. |
| Annotation content | Once the text annotation is created on the scene, add the desired annotation content to this text box. When selecting one existing text annotation on the scene, use this text box to modify its content. |
| Font parameters | Change the font, font style, font size and text color for the selected text annotation. |

| | |
|---|---|
| Make annotation text fixed | By default, a Text and arrow annotation is fixed to the part. When rotating, panning or zooming the scene, the positions of the text annotation will move accordingly. Select this option to block the position of the text annotation on the scene.<br>Note: this option is available only for Text and arrow annotation. |

- Drawing section

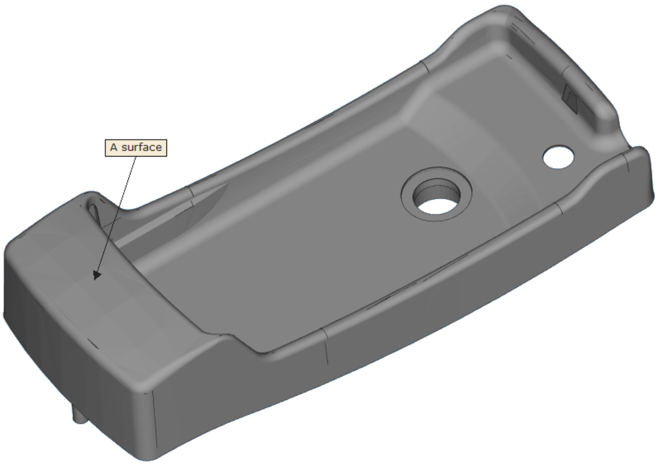
| | |
|---|---|
| Drawing dropdown | Choose between drawing a rectangle, an ellipse or to make a drawing by freehand. |
| Brush | Change the thickness or the color of the brush. These options can be edited before drawing a shape or to modify the properties of the selected drawing on the scene. |
| Restore View | A drawing is not fixed to the part. When rotating, panning or zooming the scene, the drawing will not move simultaneously. You can restore a certain view point by selecting the relevant drawing and clicking Restore View button. |

- General options

| | |
|---|---|
| Hide annotations | When checked, the created annotations are hidden. Uncheck to see the annotations. |
| Clear annotations | All created texts and drawings annotations will be removed. |
| Settings | The general settings of the annotations can be changed. |

### *16.5.1.1 Advised way of working*

If you want to create an annotation fixed to a certain point, choose Text and Arrow. Snap a point on the part and click on it to select it. A preview of the annotation will appear. Start typing the desired content for the annotation. If you need to change the position of the annotation, drag the preview to the desired location and release the left mouse button.



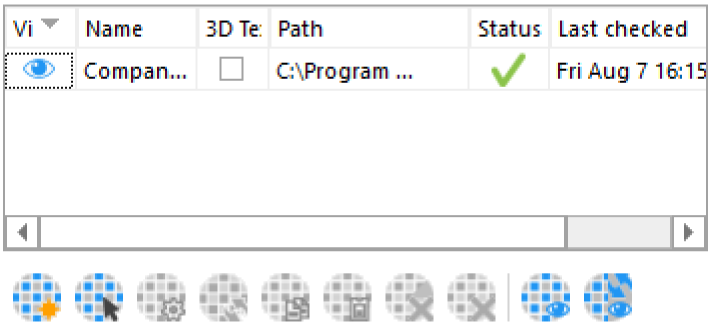

## 16.5.2 Attachments page

The Attachment Toolpage makes it easy to attach a file to the Magics project.


| | |
|---|---|
| Browse | With the Browse button you can browse to the file that has to be attached. |
| Select | By clicking the Select button an annotation can be selected. |
| Clear all | All texts, drawings and attachments will be removed. |
| Settings | General settings can be changed. |

## 16.5.3 Textures page

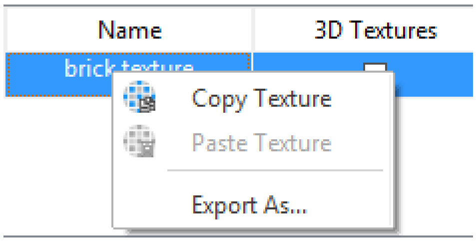
Texturing is the printing of an image on selected triangles of a part. You can read, create and save textured parts as ZPR, VRML or Magics files.




| | |
|---|---|
| Visibility | Click the “eye” icon to show/hide the texture |
| Name | Name of the textured surface. By default this is the name of the file used for the texturing, but it’s possible to change this name. |
| 3D Textures | Enable this checkbox if the texture should be converted to a 3D texture while slicing |
| Path | The location of the used texture. No path is shown when the texture isn’t applied through the Magics Texturing feature. |
| Status | Reflects whether the texture was found on the specified path and whether it was edited since it was reloaded in Magics.<br><br>Green checkmark: texture found and up to date<br>Pencil: Texture found, not up to date<br>Red cross: texture not found |
| Last checked | Date & time of the latest attempt of loading the texture. |

| | |
|---|---|
| New Texture | Add a new texture |
| Select Texture | A texture can be selected on the part. |
| Edit Texture | A texture can be edited |
| Update textures | Updates the selected texture(s). |
| Copy Texture | Copy a texture |
| Paste Texture | Paste a copied texture |
| Delete Texture | A selected texture can be removed. |
| Delete Texture from triangles | A texture can be deleted from selected triangles. |
| Toggle Texture Visibility | Toggle the visibility of all textures |
| Invert Textures Visibility | Invert the visibility of textures. |

### 16.5.3.1 Context menu

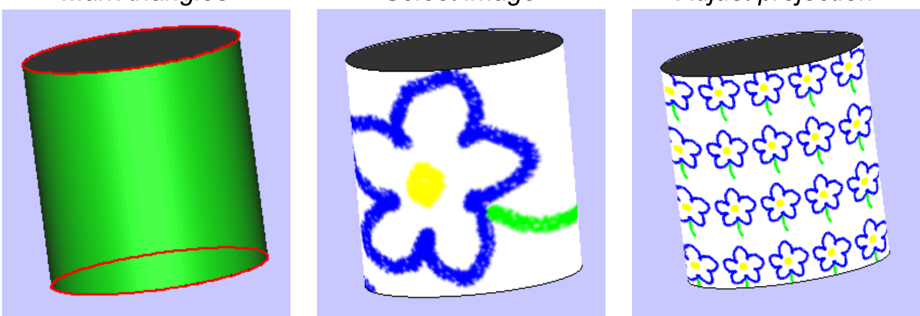



| *Feature* | *Description* |
|---|---|
| Copy | Copy (CTRL+C) the selected part texture |
| Paste | Paste (CTRL+V) the previously copied texture to (a) selected triangle(s). |
| Export As… | Save (CTRL+S) the selected texture as an image file. |

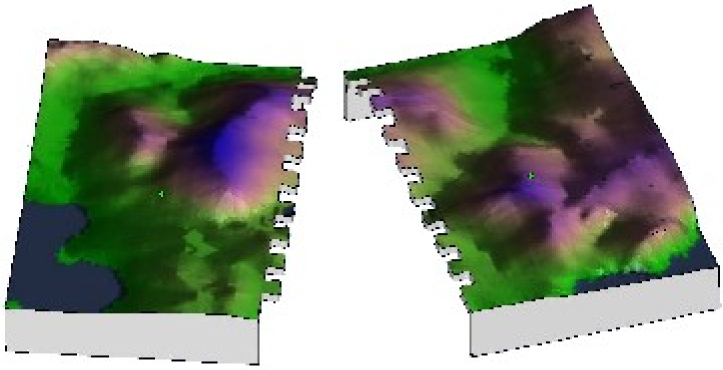
### 16.5.3.2 Advised way of working

First, you have to mark the triangles where you want to put the texture on. Then you create a new Texture in the texture Toolpage. Follow each step of the Toolpage to adjust the projection. Each change in the texturing dialog will be visualized in real-time.

*Mark triangles* *Select image* *Adjust projection*



<u>Remark</u>: After texturing, a part can be edited and/or fixed without loss of the texture. The figure below shows a textured part that is cut with a teeth cut.



## 16.6 Slices Pages

### 16.6.1 Slices page

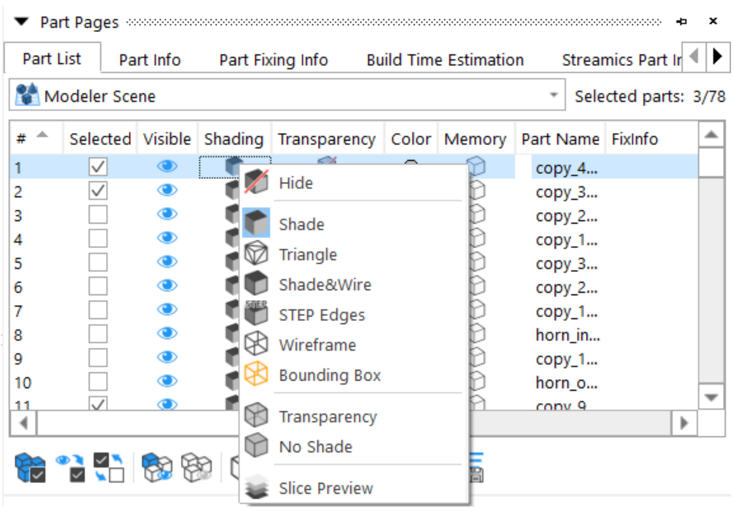
The Slice Toolpage allows the user to visualize the slices of the part. The slices can be visualized in 2D and 3D view. Measurements can also be taken on the slices.

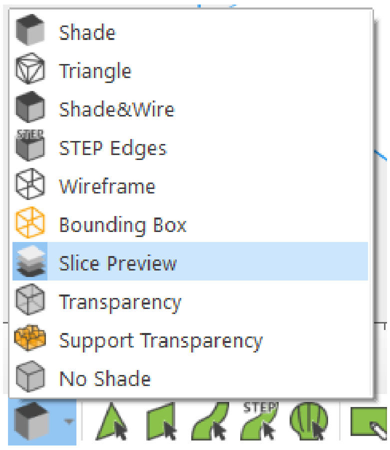
#### *16.6.1.1 Activate slices*

The Slice Toolpage comes available when slices are present in the viewport. The view mode of each individual part can be controlled through the Part List.

— STL parts (blue icons)

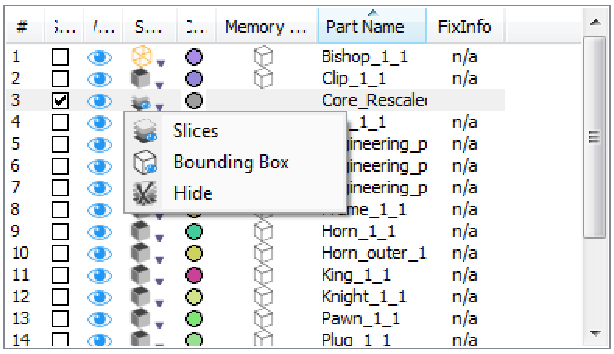
To activate slice preview on STL parts, turn their visual style to ‘Slice Preview’ in the part list. A shortcut to change the visual style of all STL parts at once can be found in the Shade modes button from toolbar.

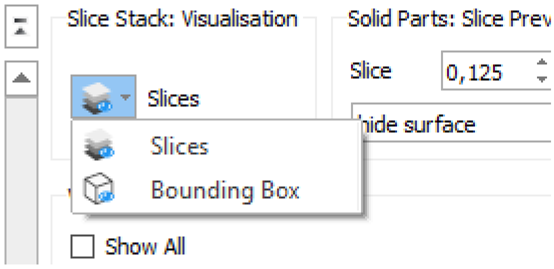


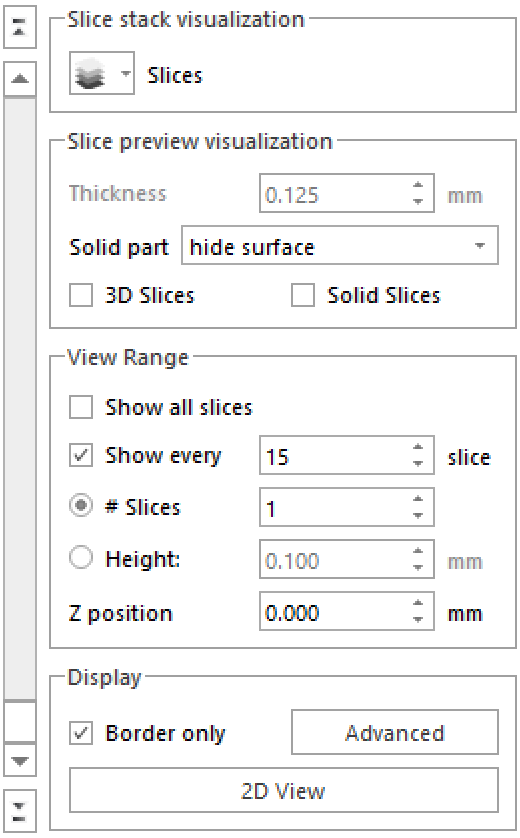
— Imported Slice Stacks (green icons)

To show the slices inside an imported slice stack, turn their visual style to ‘Slices’ in the part list. Slice Stack is activated when importing a slice file into Magics. A shortcut to change the visual style of all Slice Stacks at once can be found in the Slices page.



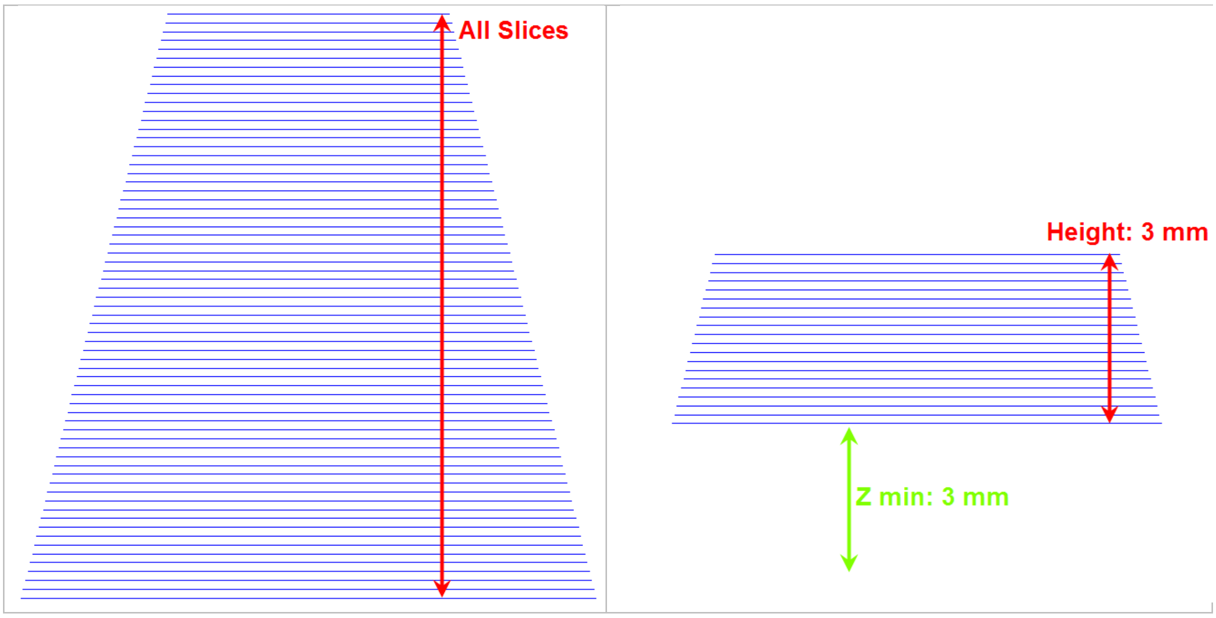




### 16.6.1.2 Visualize slices

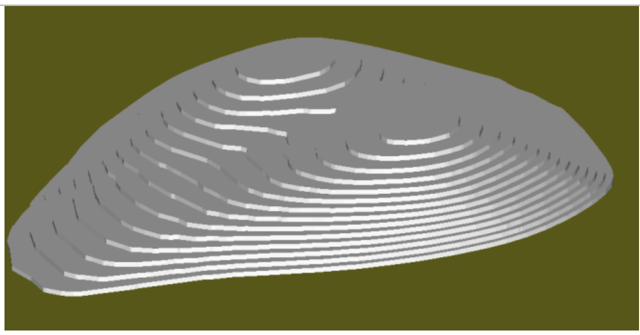



Slice Stack: Visualization (affects only Slice Stacks)

| | | |
|---|---|---|
| | Slices | Turns all Slice Stacks in the drawing to view mode 'Slices' |
| | Bounding Box | Turns all Slice Stacks in the drawing to view mode 'Bounding Box' |
| Solid Parts: Slice preview (affects only Solid parts = STL parts) | | |
| | Slice | *On modeler scene*<br>Set the layer thickness of the Slice preview<br><br>*On platform scene*<br>Shows the current layer thickness specified in the machine file |
| | Show solid part | The remainder of the solid part is still shown below as solid |
| View Range | | |
| | Show All | Visualize all slices of the imported part(s) |
| | Slices | Set the number of slices in the view range |
| | Height | Set the height of the view range |
| | Z min | Set the bottom of the view range. This value can also be manipulated with the slider on the side |

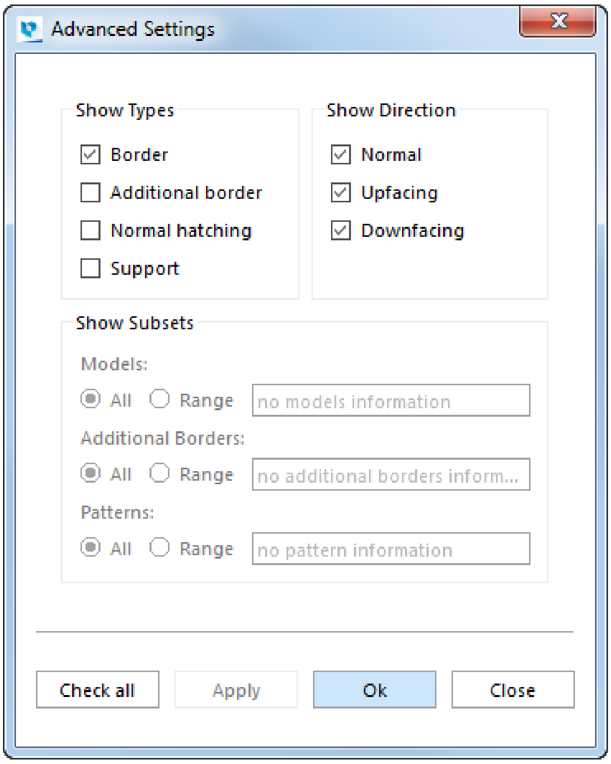



| | | |
|---|---|---|
| Display | | |
| | Solid Slices | Show all the slices filled. |
| | 3D Slices | Show the slices thick and filled. If 3D Slices is turned on, all other information in the slice stack is hidden. |

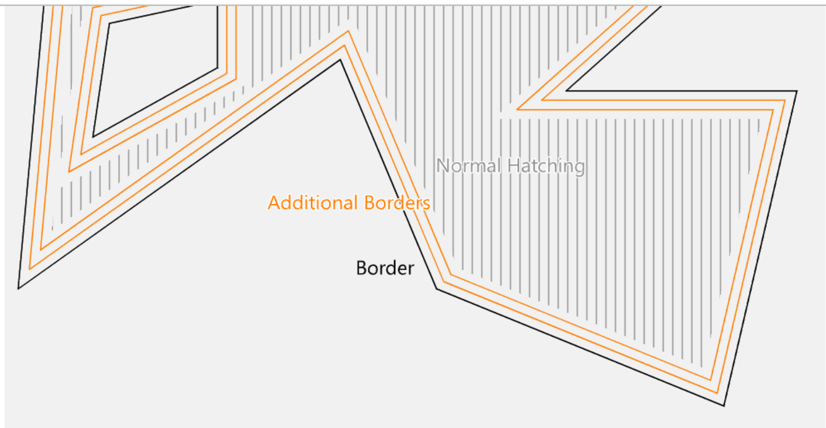
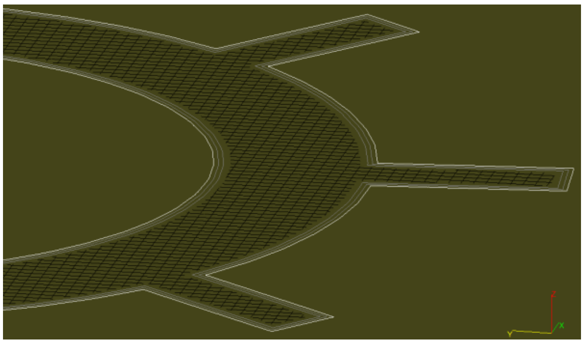
| | | |
|---|---|---|
| | |  |
| | Borders only | Turned on: only the border (=contour) is shown. Turned off: all available information is shown. This can be controlled more in detail through the Advanced View Settings |
| | 2D/ 3D View | 2D: Locks the viewport to TOP view<br>3D: Releases the viewport and enables orbiting |

### 16.6.1.3 Advanced View Settings

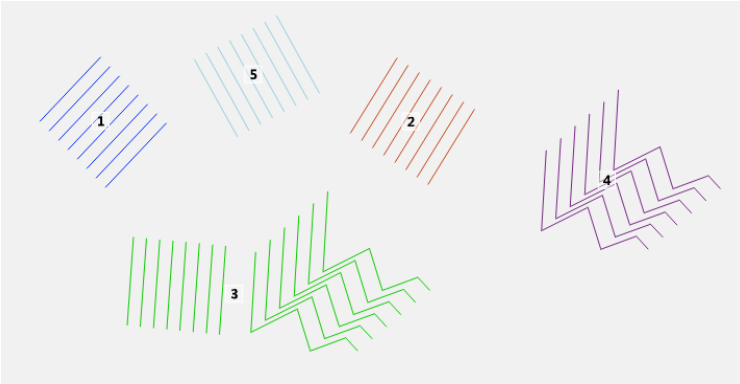
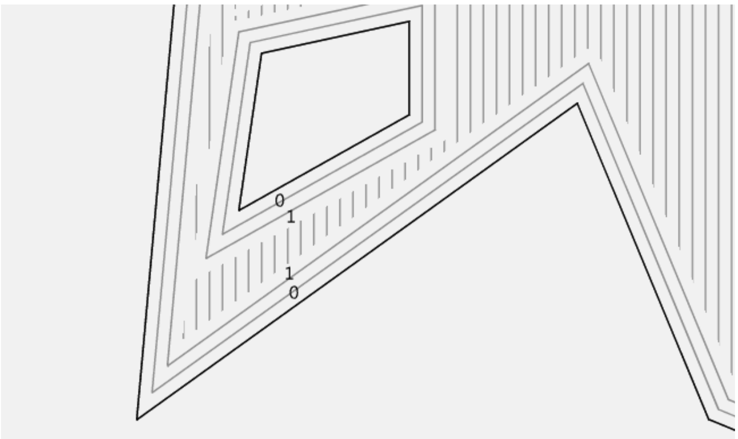
A slice stack can contain a range of information. If that information is present in the source file, this dialog allows more control over the set of information that is shown.

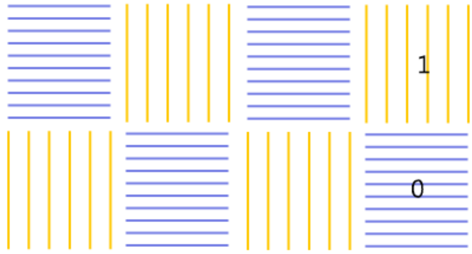



| Show Types |
|---|

| | | |
|---|---|---|
| | <br> | |
| | Border | Turn border on/off |
| | Additional Borders | Turn additional borders on/off<br>If the border is offset a number of times, it's called Additional Borders. |
| | Normal Hatching | Turn normal hatching on/off<br>Normal Hatching is the collection of vectors used to fill the layer during the scan process.<br>*Hatching example*<br> |
| | Support | Turn support on/off<br>Sliced support |

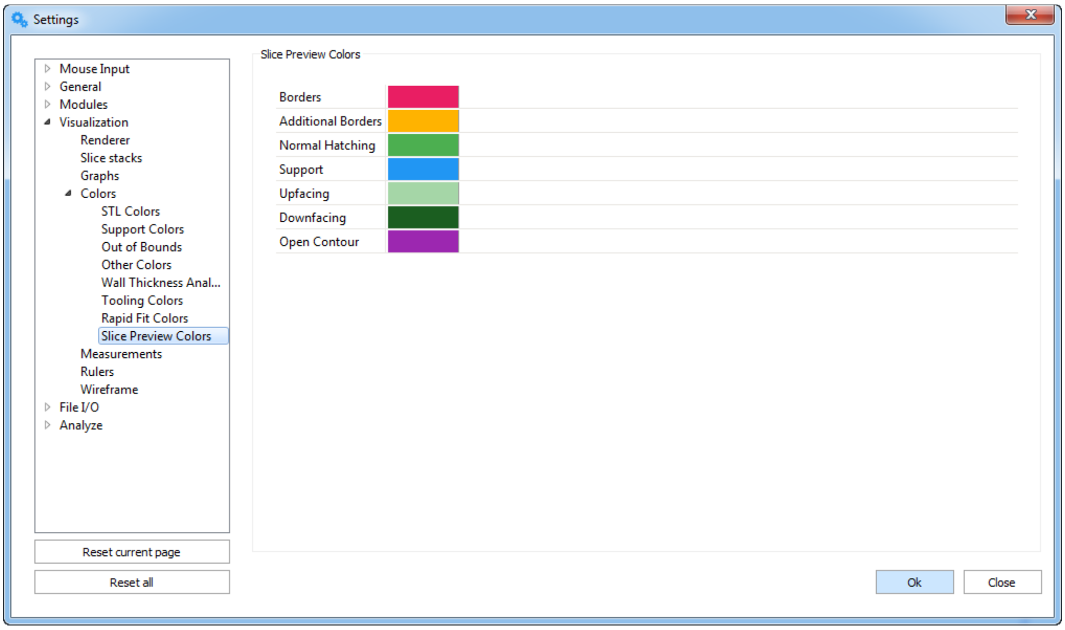
| Show Direction | | |
|---|---|---|
| | Normal | Turn normal vectors on/off<br>All slice information that is not upfacing nor downfacing |
| | Upfacing | Turn upfacing vectors on/off<br>The result of slicing a horizontal region without geometry on top of it. |
| | Downfacing | Turn downfacing vectors on/off<br>The result of slicing a horizontal region without geometry below it. |

<table>
<tr><td colspan="4">Show Subsets</td></tr>
<tr><td rowspan="7"></td><td rowspan="3">Models</td><td colspan="2">If the slice stack kept information about the original models (parts) before slicing, they are indexed from 0 to the amount of models.<br><br></td></tr>
<tr><td>All</td><td>Show all the models</td></tr>
<tr><td>Range</td><td>A range can be entered as:<br>- a list: 2,5,6,9<br>- a range: 3-8<br>- combination of both: 2,6-9<br>and will only show the models with that index</td></tr>
<tr><td rowspan="3">Additional Borders</td><td colspan="2">The additional borders are numbered starting from 0 for the outer most additional border, inwards.<br><br></td></tr>
<tr><td>All</td><td>Show all the additional borders</td></tr>
<tr><td>Range</td><td>Show only a subset of the additional borders</td></tr>
<tr><td>Patterns</td><td colspan="2">When certain hatches are collected into groups, they are called patterns.</td></tr>
</table>

| | | | |
|---|---|---|---|
| | |  | |
| | | All | Show all the patterns |
| | | Range | Show only a subset of the patterns |

### *16.6.1.4 Color Settings*

All color settings regarding the slice visualization can be adapted here.




_Remark_: Open contours overwrites other colors.

materialise

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# Part III: Magics Modules

# 1 Chapter 1: Structures

The module is designed for when one wants to reduce the weight and material of a design. The Structures wizard will guide you to through a few steps in order to hollow the part, and fill them with lightweight structures. Furthermore one can easily add holes to allow the powder to escape.

Other uses could be to fully convert a part by a lattice, this is often done for tissue engineering, in which case the tissue will grow in to lattice.

The most optimal structure can be created by choosing a unit structure from the library or by simply adding a self designed unit structure.

Other applications of structures could involve temperature control, creation of functional surfaces, support generation and many more!

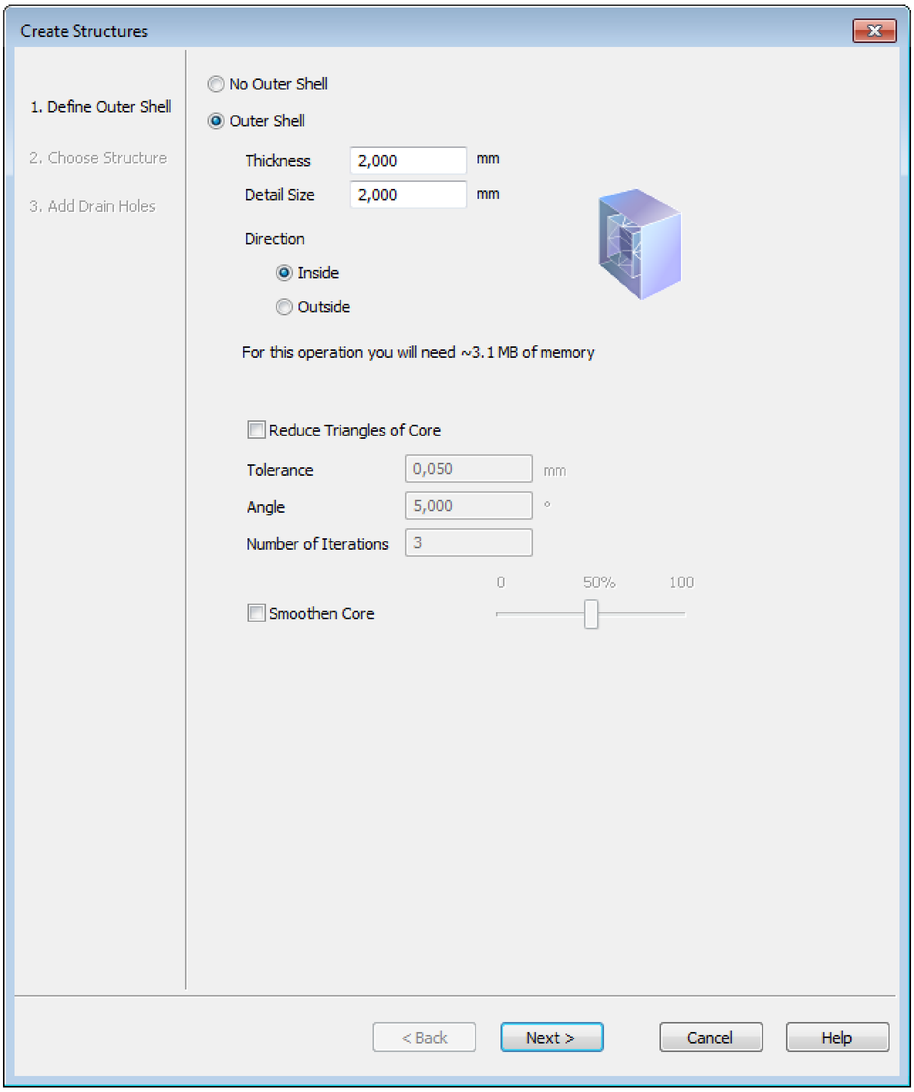
## 1.1 Create Structures Dialog

To create structures, select the desired part(s) and open the Structures dialog.

The wizard consists out of 3 pages:

- Define outer Shell
- Choose Structure
- Add Drain Holes

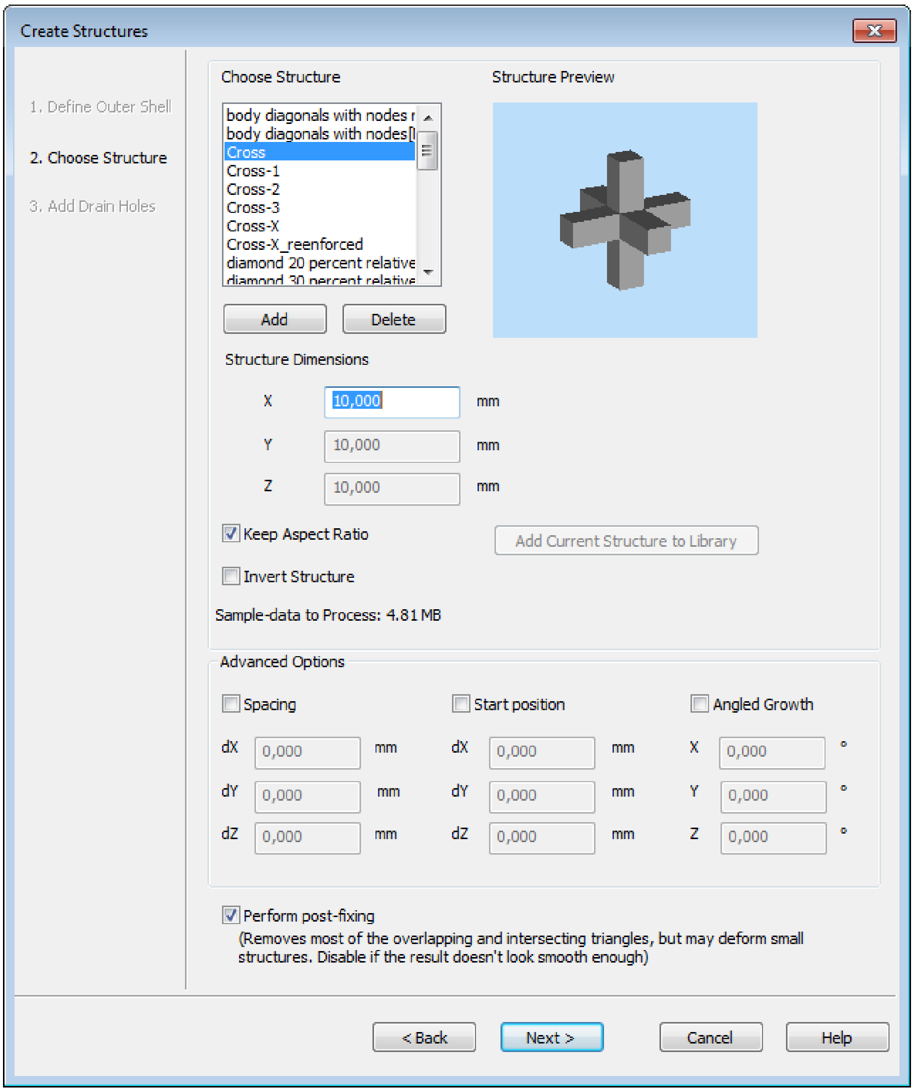
### 1.1.1 Define outer shell



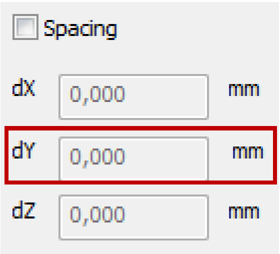
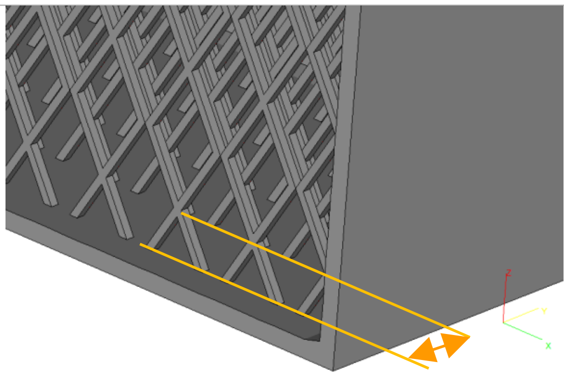
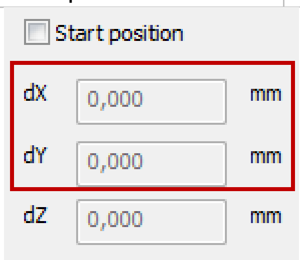
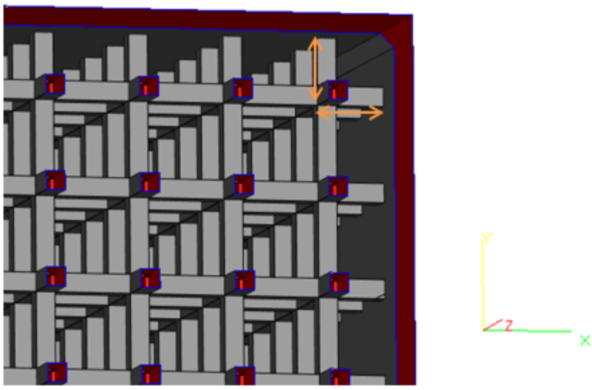
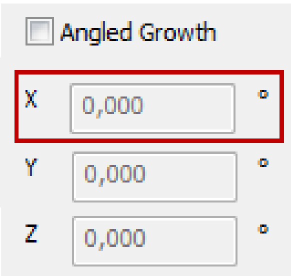
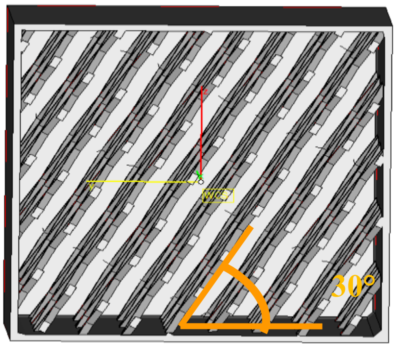

| | |
|---|---|
| No outer shell | The part will be fully replaced by a lattice and will not have an outer shell |
| Outer shell | The part will receive a shell |
| Thickness | This value displays the distance over which the triangles of the original shell get an offset in order to generate a hollow part. |
| Detail Size | This value displays the level of detail that will remain in the new shell. Standard, this value should be the same as the smallest detail of the part. The smaller this value, the more triangles will be included in the new shell and the more detail can thus be incorporated.<br>*Remark:* If the smallest detail is chosen too high, it is possible that the internal wall intersects with the external wall. |
| Direction | Here you determine if you want to create a new shell at the interior or at the exterior of the existing shell. |

<table>
<tr><td>Memory requirements</td><td colspan="2">While you set the parameters, Magics makes an estimation of the quantity of free RAM that will be needed during the calculation and of the number of triangles that will be created. You'll need to enter new values in the Wall Thickness and Smallest Detail fields to see a new estimation of the amount of RAM and new triangles. The amount of triangles can later on be reduced with the Triangle Reduction function. The memory requirements depend greatly on the value set for Smallest Detail.</td></tr>
<tr><td rowspan="4">Reduce triangles of Core</td><td colspan="2">Because the hollow function creates a lot of triangles, you have the possibility to reduce these at once.</td></tr>
<tr><td>Tolerance</td><td rowspan="3">Triangle Reduction</td></tr>
<tr><td>Angle</td></tr>
<tr><td>Number of Iterations</td></tr>
<tr><td>Smoothen Core</td><td colspan="2">By checking this option a smoothing will be performed on the created core.</td></tr>
</table>

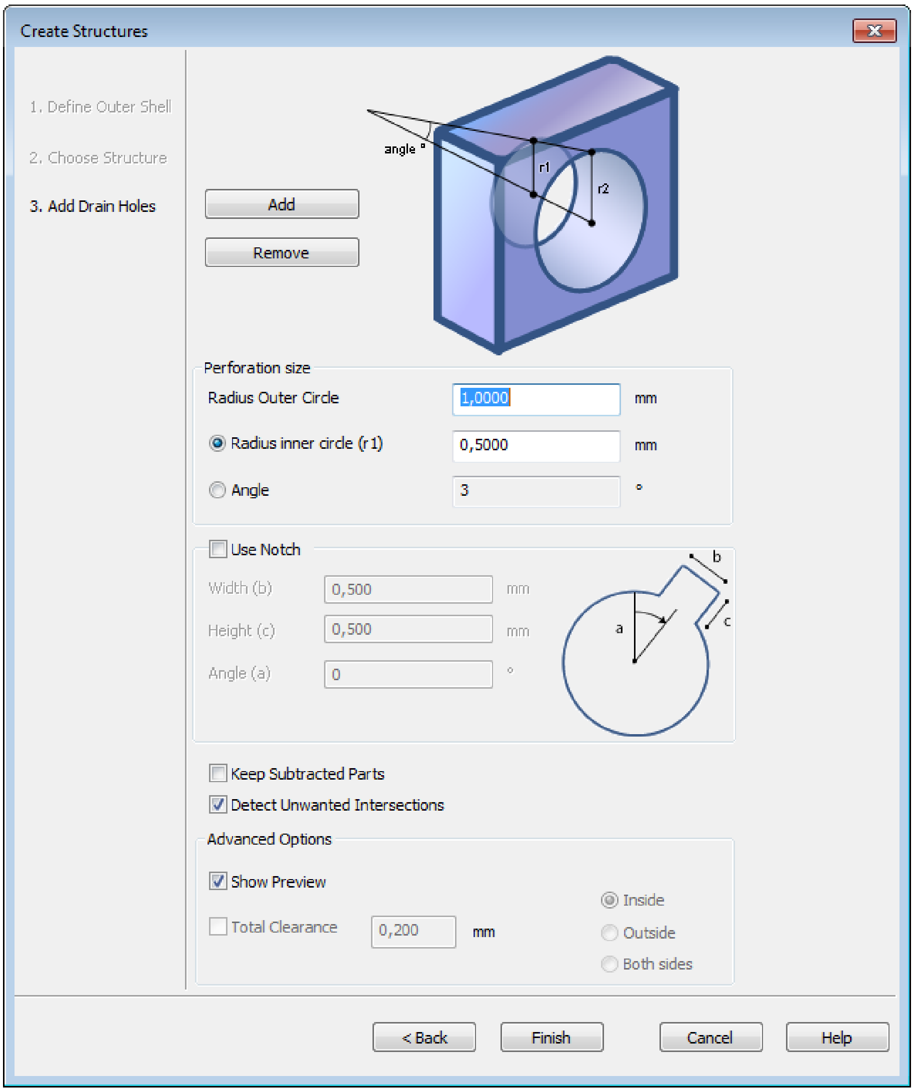
## 1.1.2 Choose Structure



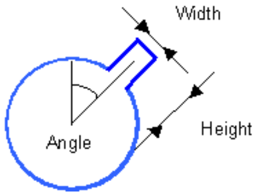
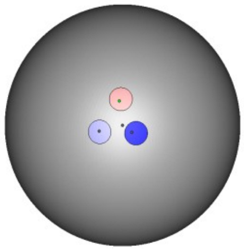
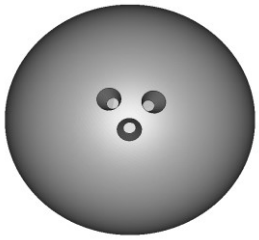
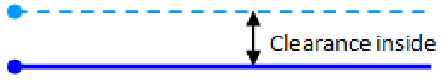
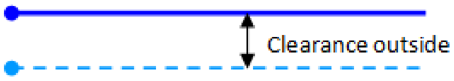
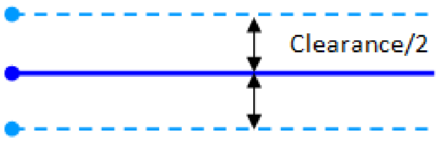

| | | |
|---|---|---|
| Choose Structure | This shows a library with unit structures that can be used for lattice generation. | |
| | Add | Add structures to the library |
| | Delete | Delete structures from the library |
| | Structure Preview | A preview of the unit structure is shown |
| Structure Dimensions | Here you can specify the length in X, Y and Z of the unit structure | |
| | Keep Aspect Ratio | When this is checked the Y and Z length will be rescaled uniformly with the X length |
| | Invert Structure | Instead of converting the part by the lattice, the lattice will be subtracted from the part |
| | Sample Data to Process | The amount of memory necessary to create specified lattice |
| Advanced Options | Spacing | A spacing will be given between the bounding boxes of the unit structure |

| | | |
|---|---|---|
| |  |  |
| | Start position | The start position of structure can be defined |
| |  |  |
| | Angled Growth | The whole lattice will be generated under specified angle |
| |  |  |

### 1.1.3 Add Drain Holes




| | | |
|---|---|---|
| Add | | When clicking add the perforation is being constructed but not yet subtracted. |
| Remove | | Unwanted perforation can be deleted when pressing this button. |
| Perforation size | | Define the size of the perforation |
| | Radius outer circle (r2) | Here you determine the radius of the outer circle of the perforation. |
| | Radius inner circle (r1) | Here you can determine the radius of the inner circle of the perforation. |
| | Angle | Here you can determine the angle of the perforation |
| Use notch | | Define the size of the notch |
| | Width (b) | |
| | Height (c) | |

| | | |
|---|---|---|
| | Angle (a) |  |
| Keep subtracted parts | | When checked, the subtracted part(s) are kept. If not checked subtracted part(s) are unloaded automatically. |
|  | |  |
| With subtractions | | Without subtractions |
| Detect unwanted intersections | | Collisions will be detected when a cone is added. Default on. (See Perforator/Advanced options, page119) |
| Advanced options | | |
| | Show preview | When checked a preview of the perforation is shown |
| | Total clearance | Define an offset towards the inner, outer or both sides of the intersecting line between the parts. This way you introduce a little gap between the parts that result from the perforation. |
| | Inside |  |
| | Outside |  |
| | Both sides |  |

## 1.2 Create Slice-based structures dialog

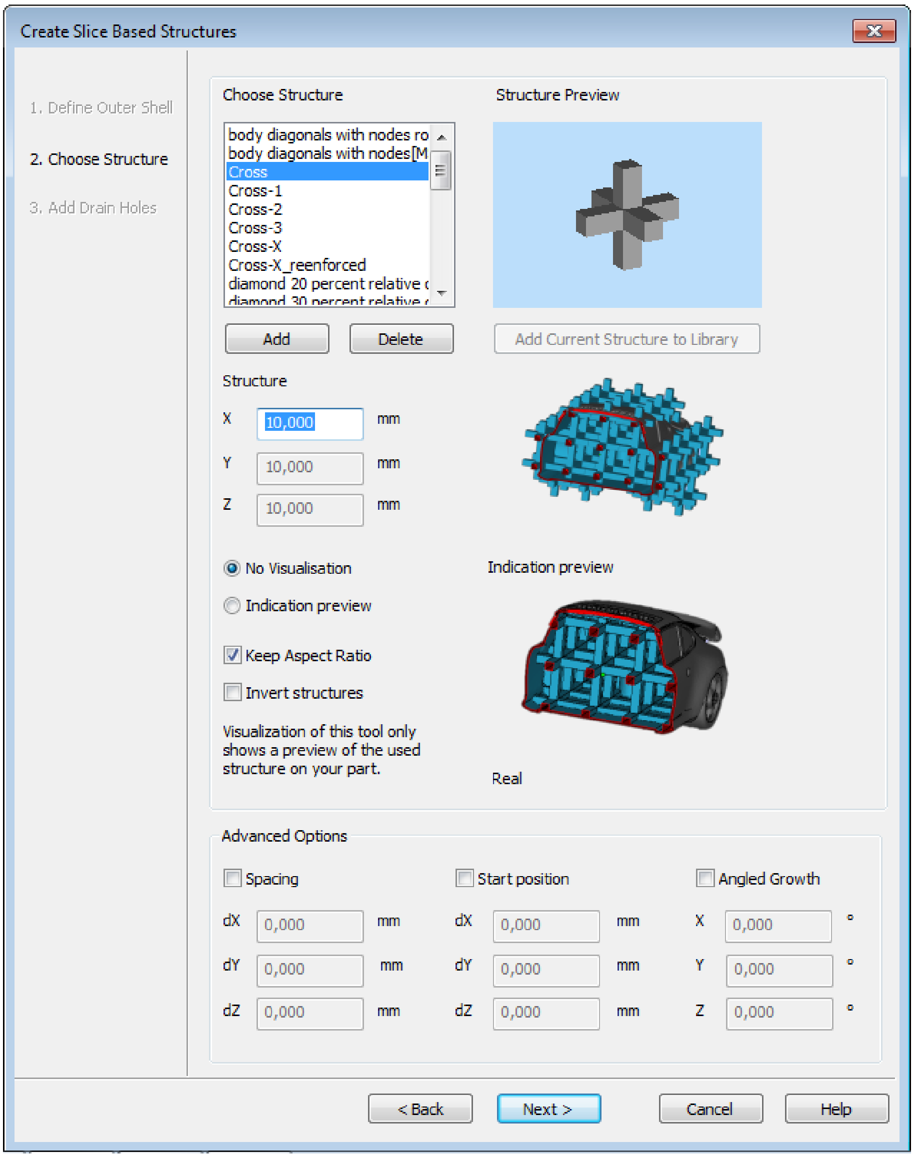
The wizard consists out of 3 pages:

- Define outer Shell
- Choose Structure
- Add Drain Holes

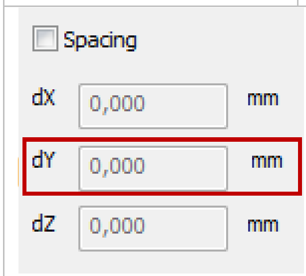
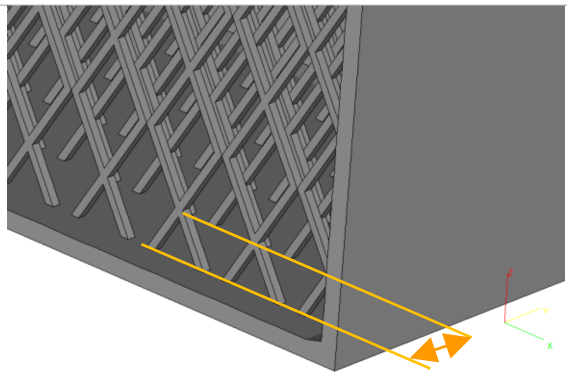
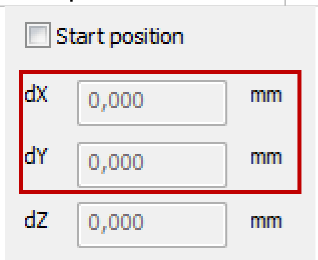
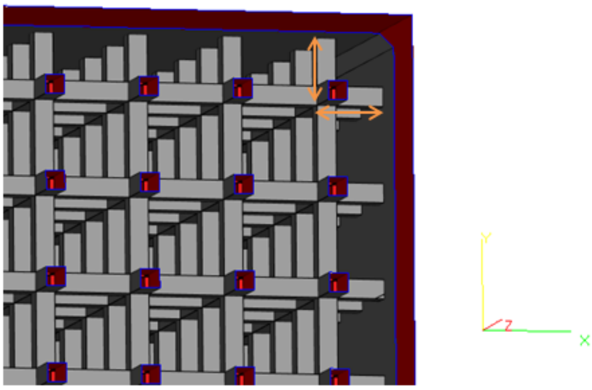
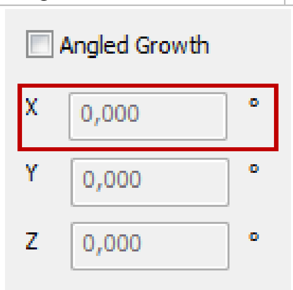
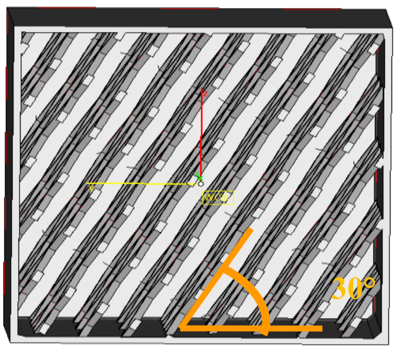
### 1.2.1 Define outer shell

— See Define outer shell, page 459

### 1.2.2 Choose Structure




| | | |
|---|---|---|
| Choose Structure | This shows a library with unit structures that can be used for lattice generation. | |
| | Add | Add structures to the library |
| | Delete | Delete structures from the library |
| | Structure Preview | A preview of the unit structure is shown |
| Structure | Here you can specify the length in X, Y and Z of the unit structure | |
| | No Visualisation | Choose to preview the structure generation or not |

| | | |
|---|---|---|
| | Indication Preview | |
| | Keep Aspect Ratio | When this is checked the Y and Z length will be rescaled uniformly with the X length |
| | Invert Structure | Instead of converting the part by the lattice, the lattice will be subtracted from the part |
| | Sample Data to Process | The amount of memory necessary to create specified lattice |
| Advanced Options | Spacing | A spacing will be given between the bounding boxes of the unit structure |
| |  |  |
| | Start position | The start position of structure can be defined |
| |  |  |
| | Angled Growth | The whole lattice will be generated under specified angle |
| |  |  |

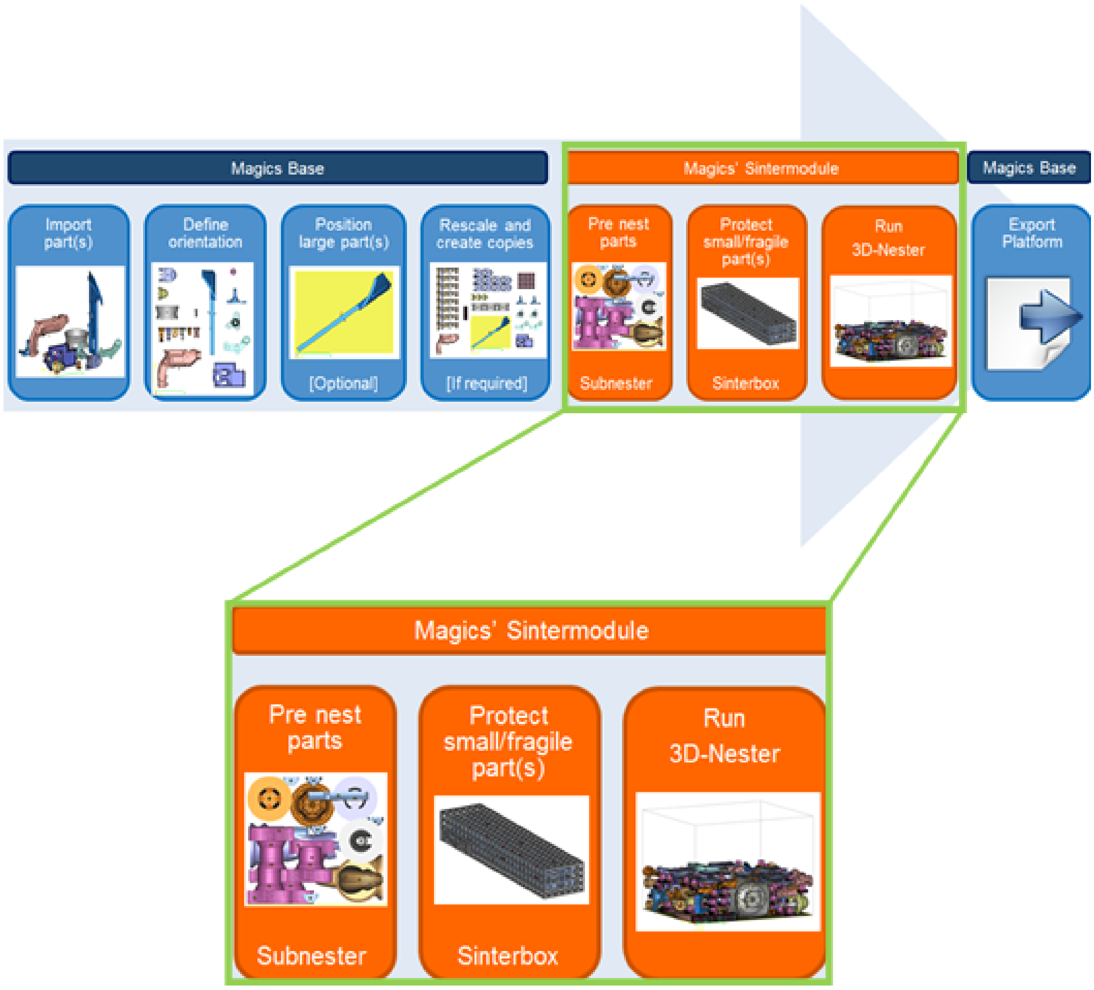
### 1.2.3 Add Drain Holes

— See Add Drain Holes, page 463

# 2 Chapter 2: Sintermodule

Magics Sintermodule offers you the ideal solution for automated part nesting. The different aspects of the module will take your end result to a higher level.

1. Pre nesting of small and fragile parts
2. Create Sinterboxes of the pre-nested part to find them easily after building
3. Run the 3D nester including parts and Sinterboxes

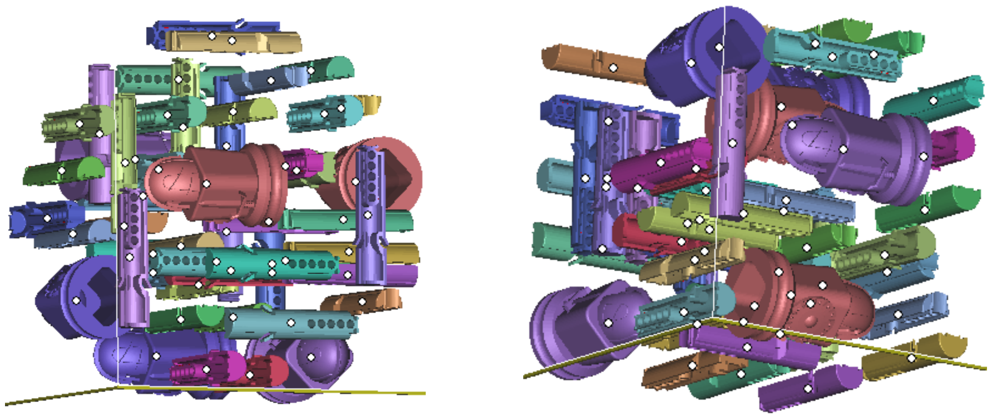



## 2.1 Subnester

### 2.1.1 Introduction

The Subnester is a pre–nester which can be executed before creating your Sinterbox. It will nest selected parts according to the specifications set by you. In this way small and fragile parts are nicely nested together.

The Subnester provides 2 different types of placement solution: a box based or sphere based solution.



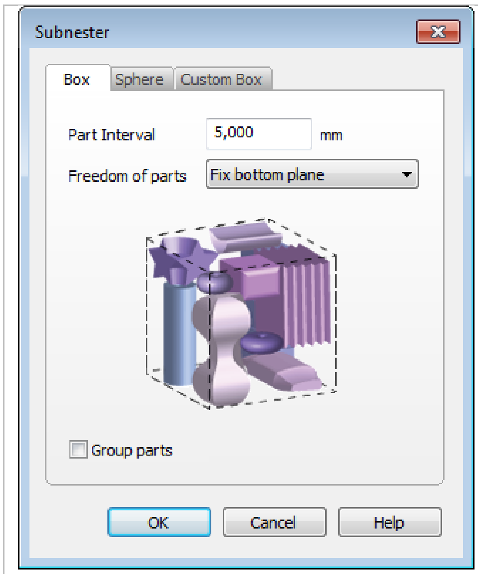
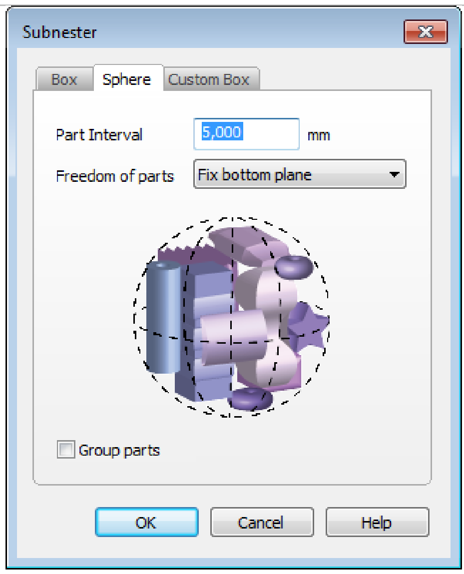
## 2.1.2 Workflow


— Import part(s)
— Define orientation
— Position large part(s)
— Create virtual copies
— Pre nest parts
— Protect small/ fragile part(s)
— Run 3D Nester
— Export platform

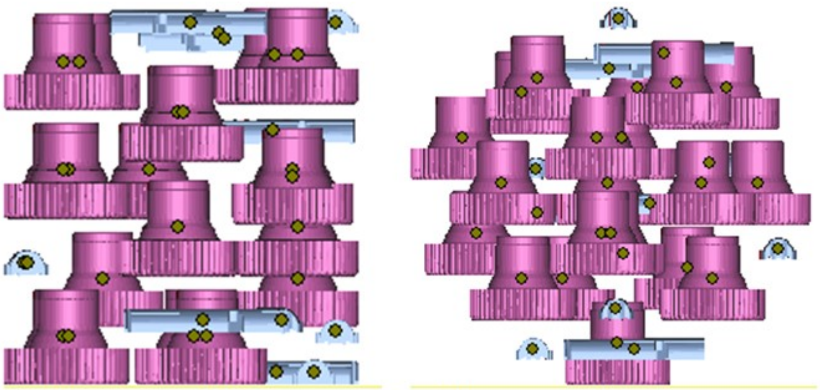
## 2.1.3 Subnester dialog

### *2.1.3.1 Box / Sphere*

The Subnester part exists out of one simple dialog, providing you all possibilities to easily pre–nest your parts.

<table>
<tr>
<td>
</td>
<td>
</td>
</tr>
<tr>
<td>The selected parts are nested in a box based shape.<br><br>The box placement solution is best chosen when creating afterwards a box based Sinterbox.</td>
<td>The selected parts are nested in a sphere based shape.<br><br>The sphere placement solution is best chosen when creating afterwards a freeform based Sinterbox.</td>
</tr>
</table>

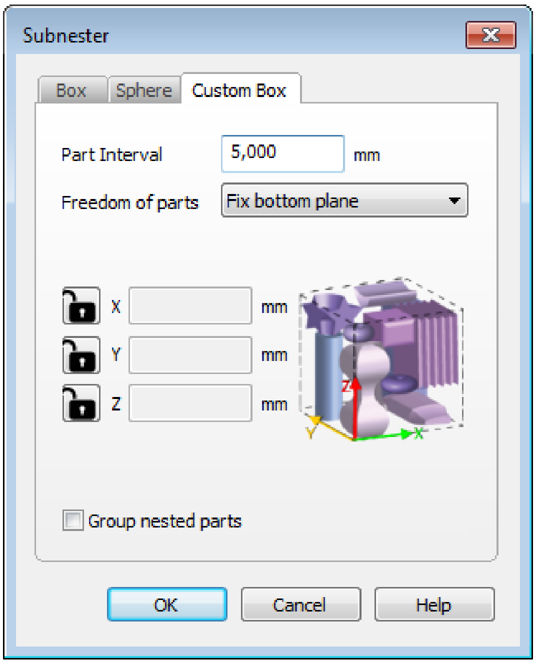
<table>
<tr><td>Part interval</td><td colspan="2">This value refers to the minimal distance between two parts</td></tr>
<tr><td rowspan="4">Freedom of parts</td><td colspan="2">Choose the type restriction to translate and rotate your parts</td></tr>
<tr><td>Fix bottom plane</td><td>The part will only turn around the Z axis, translation is free.</td></tr>
<tr><td>Translate only</td><td>The part will only be translated.</td></tr>
<tr><td>Rotate 90° and translate</td><td>The part will be translated and rotated by 90°</td></tr>
<tr><td>Group parts</td><td colspan="2">When checked the parts pre-nested parts are placed in a group and are treated as one part.</td></tr>
</table>



Placement solution: ***Box*** Placement solution: ***Sphere***

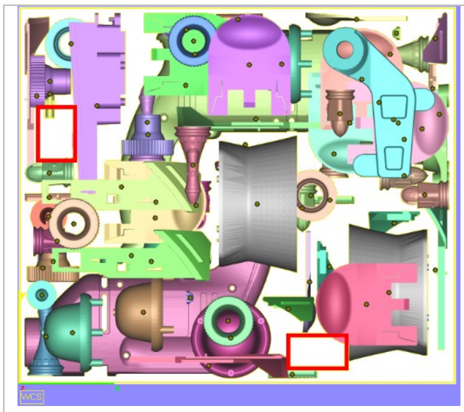
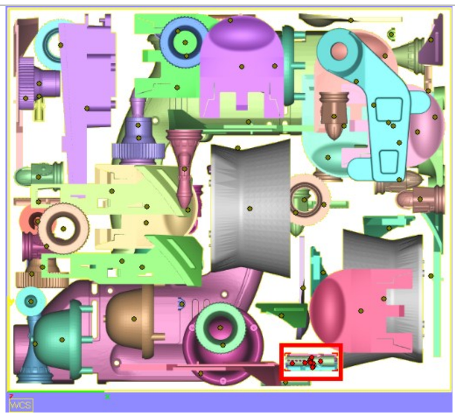
### 2.1.3.2 *Custom Box*

The user can create a custom box to pre-nest parts to fit within the still available space (box) on the platform.




| | | |
|---|---|---|
| Part interval | This value refers to the minimal distance between two parts | |
| Freedom of parts | Choose the type restriction to translate and rotate your parts | |
| | Fix bottom plane | The part will only turn around the Z axis, translation is free. |
| | Translate only | The part will only be translated. |

| | | |
|---|---|---|
| | Rotate 90° and translate | The part will be translated and rotated by 90° |
| XYZ locked/ unlocked | Specify the maximum amount of space available | |
| Group parts | When checked the parts pre-nested parts are placed in a group and are treated as one part. | |

| | |
|---|---|
|  |  |
| Platform with ‘free’ space | Parts nested based upon ‘free’ space and placed within the build |

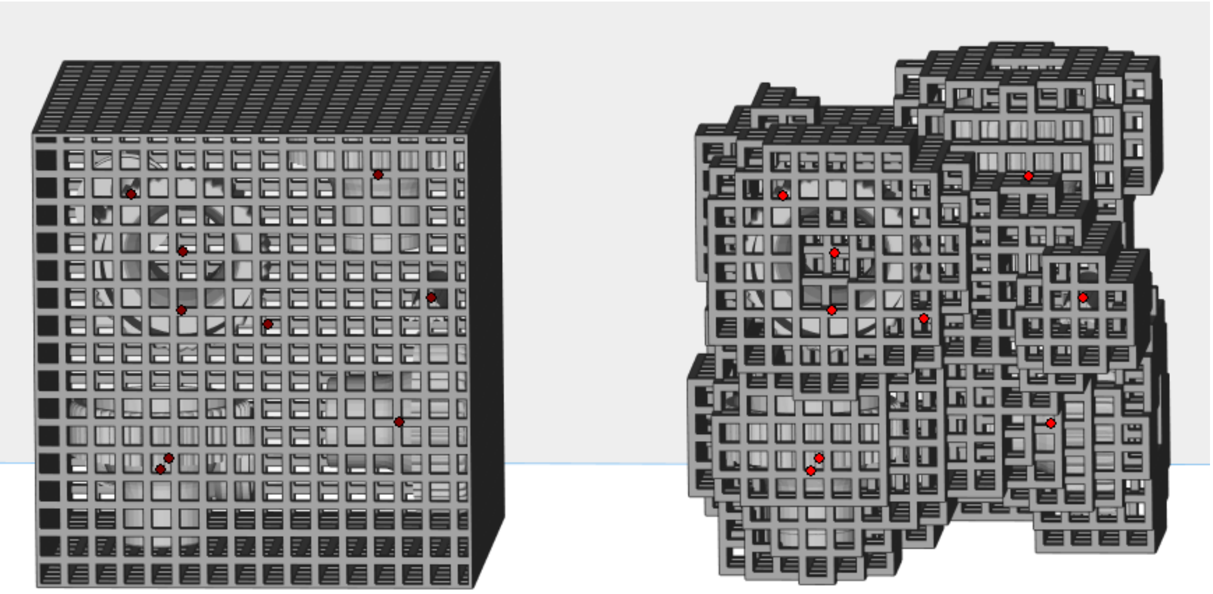
## 2.2 Sinterboxes

### 2.2.1 Introduction

The Sinterboxes can be used to protect your small and fragile parts. After building they can easily be found due to the box around them.

There are 2 different types of Sinterboxes that can be created: a box based Sinterbox or a freeform Sinterbox following the shape of your parts.

The box is created within 3 easy steps.

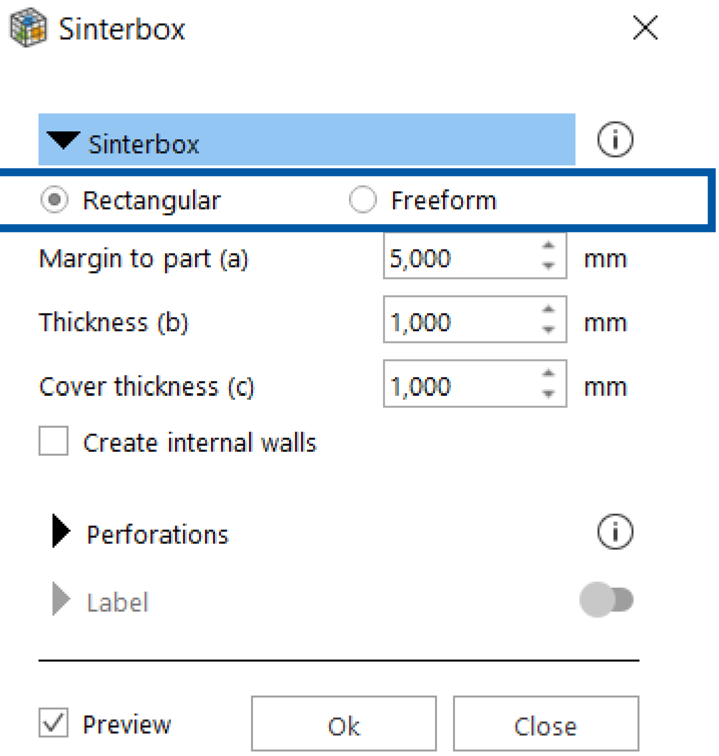


## 2.2.2 Workflow


- Import part(s)
- Define orientation
- Position large part(s)
- Create virtual copies
- Pre nest parts
- Protect small/ fragile part(s)
- Run 3D Nester
- Export platform

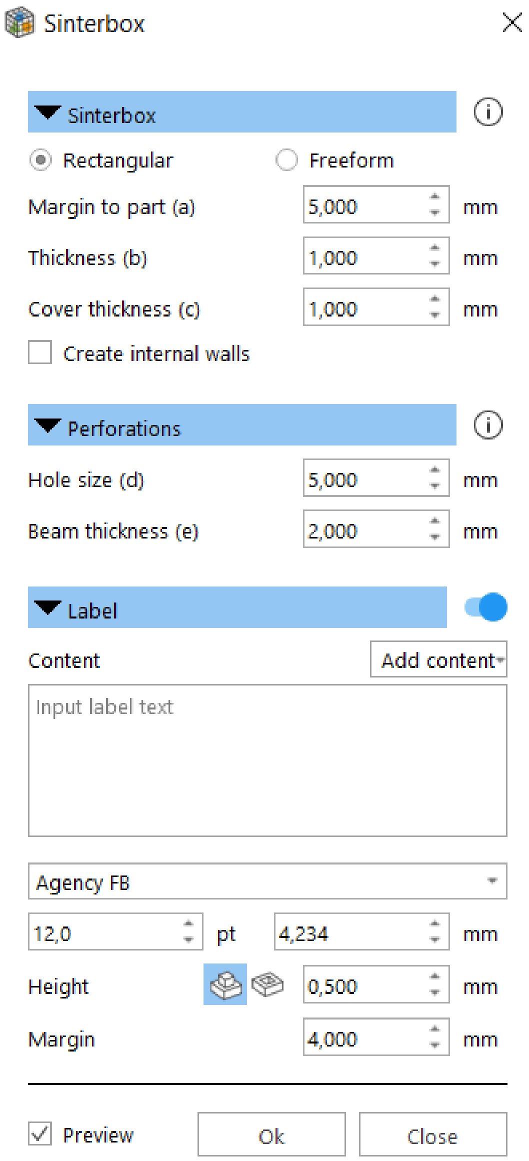
### 2.2.3 Sinterbox window

Sinterbox Choose between a Rectangular shaped sinterbox and a Freeform sinterbox which follows the outer line of your parts.



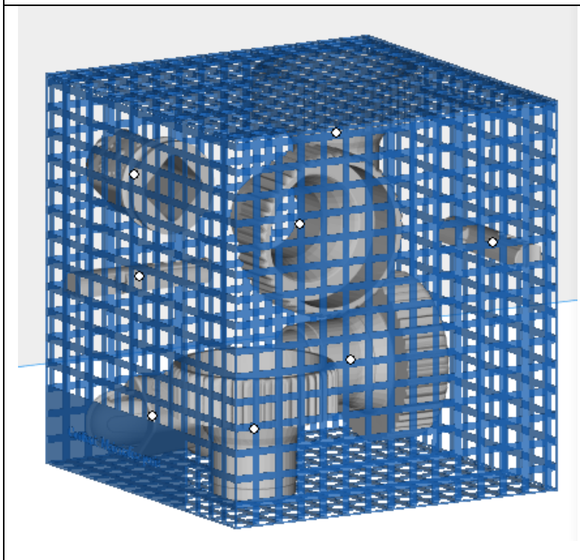
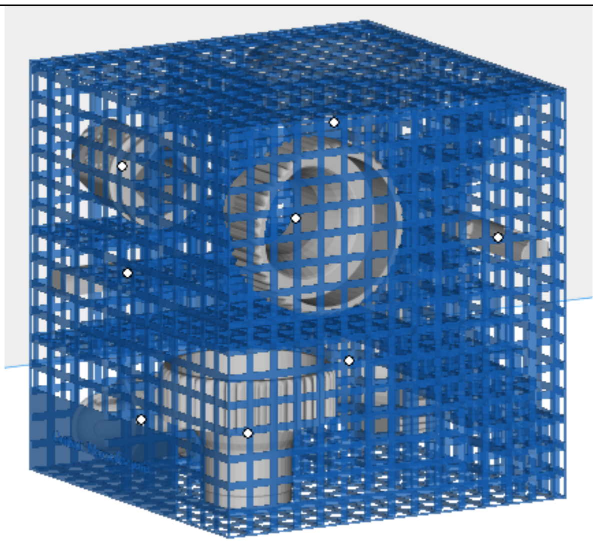

#### *2.2.3.1 Rectangular sinterbox*

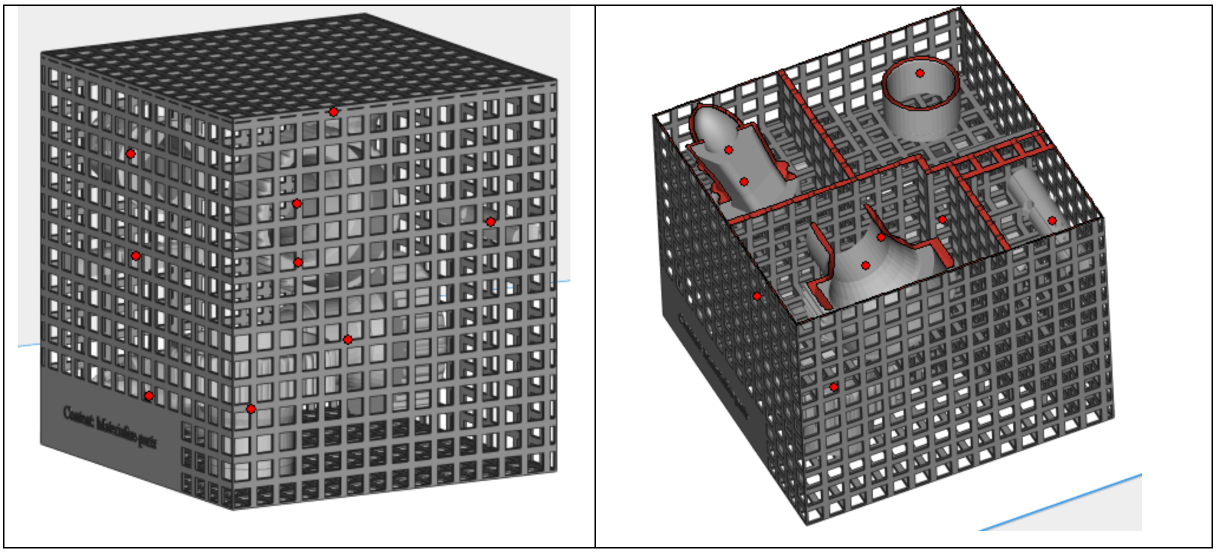
Directly create a rectangular sinterbox around the selected parts.




| **Sinterbox** | |
|---|---|
| Margin to part (a) | The minimum distance between (the bounding box of) a part and the edge of the Sinterbox |
| Thickness (b) | The wall thickness of the box, except the cover thickness |
| Cover thickness (c) | The wall thickness of the cover of the box |
| Create internal walls | Creates walls in between parts within the rectangular sinterbox. At the end, each part will have its own compartment in the sinterbox. The thickness of the internal walls is the same as Beam thickness (e), the thickness defined for the perforations.<br>*Note:* To calculate the position of the walls, the bounding box of each part is used. |
| **Perforations** | |
| Hole size (d) | You can define the size of the perforation |
| Beam thickness (e) | The distance between two perforations |

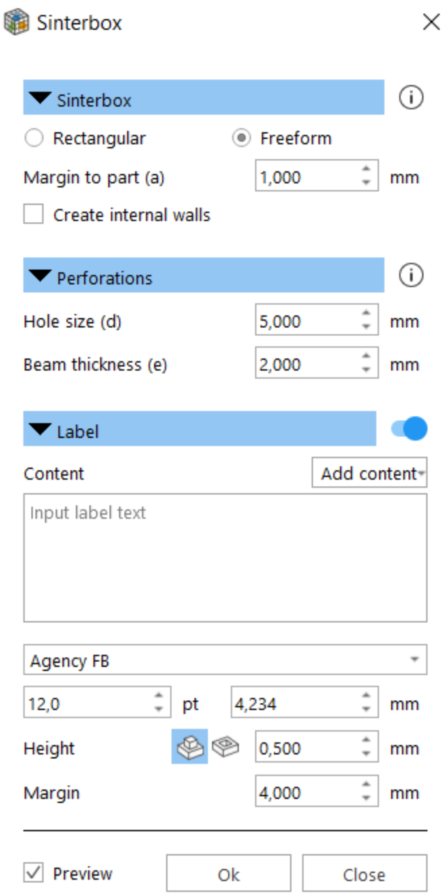
| Label | |
|---|---|
| Add content | Part names will enter all the part names as text to the label. Amount of parts will enter the total amount of parts inside the sinterbox to the label. |
| Content | Type here the text you'd like to have on the sinterbox. |
| Font | Indicates the style of the text of the label. |
| Size | Indicate the size of the text in pt or mm. |
| Raised/Engraved | Indicate if the text of the label should be raised or engraved. |
| Height | Indicate the height or depth of the label. |
| Margin | Distance between text and edge of the box. |
| **Preview** | |
| Preview | Shows a preview of the sinterbox. |

| Rectangle sinterbox; No internal walls; Preview | Rectangle sinterbox; Internal walls; Preview |
|---|---|
|  |  |
| Rectangle sinterbox; No internal walls; Applied | Rectangle sinterbox; Internal walls; Applied |



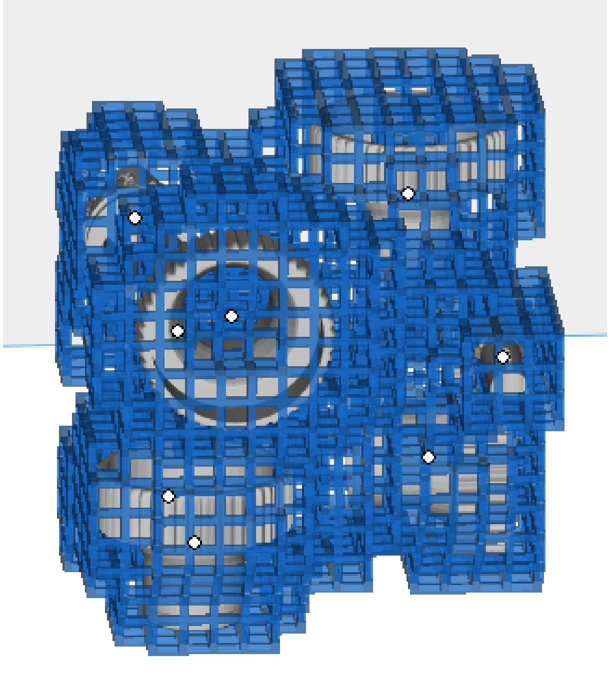
### 2.2.3.2 *Freeform Sinterbox*

Directly create a freeform Sinterbox around the selected parts.

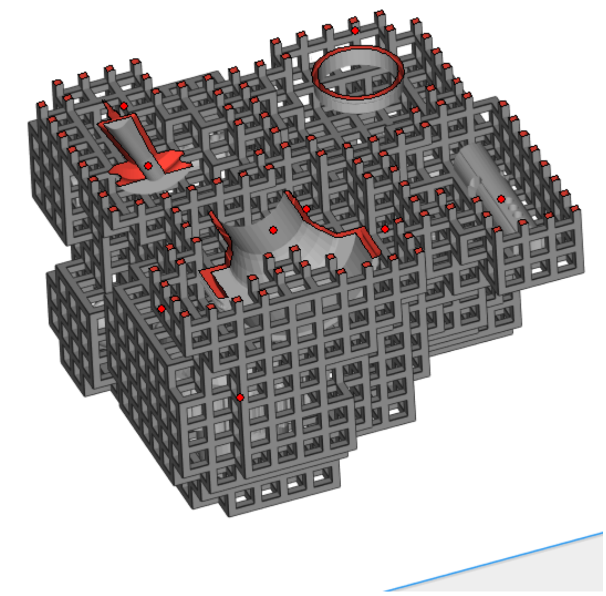


| Sinterbox | |
|---|---|
| Margin to part (a) | The minimum distance between (the bounding box of) a part and the edge of the Sinterbox |
| Create internal walls | Creates walls in between parts within the freeform sinterbox. At the end, each part will have its own compartment in the sinterbox.<br>The thickness of the internal walls is the same as Beam thickness (e), the thickness defined for the perforations.<br>*Note:* To calculate the position of the walls, the geometry of each part is used. |
| **Perforations** | |
| Hole size (d) | You can define the size of the perforation |
| Beam thickness (e) | The distance between two perforations |
| **Label** | |
| Add content | Part names will enter the all part names as text to the label. Amount of parts will enter the total amount of parts inside the sinterbox to the label. |
| Content | Type here the text you'd like to have on the sinterbox. |
| Font | Indicates the style of the text of the label. |
| Size | Indicate the size of the text in pt or mm. |
| Raised/Engraved | Indicate if the text of the label should be raised or engraved. |
| Height | Indicate the height or depth of the label. |
| Margin | Distance between text and edge of the box. |
| **Preview** | |
| Preview | Shows a preview of the sinterbox. |

Freeform sinterbox; Internal walls; Preview



Freeform sinterbox; Internal walls; Applied



## 2.3 3D Nester

### 2.3.1 Introduction

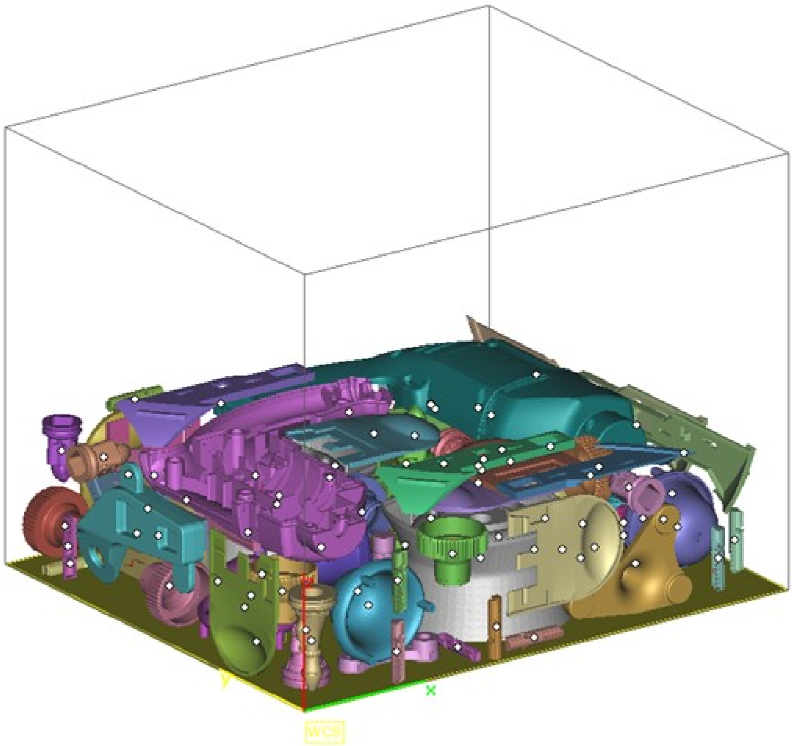
Magics 3D Nester assures an optimal load for your sintering machine(s).

Considering the parts' geometry, the software automatically nests your parts, maximizing the number of parts in the build envelope and/or minimizing the build time.

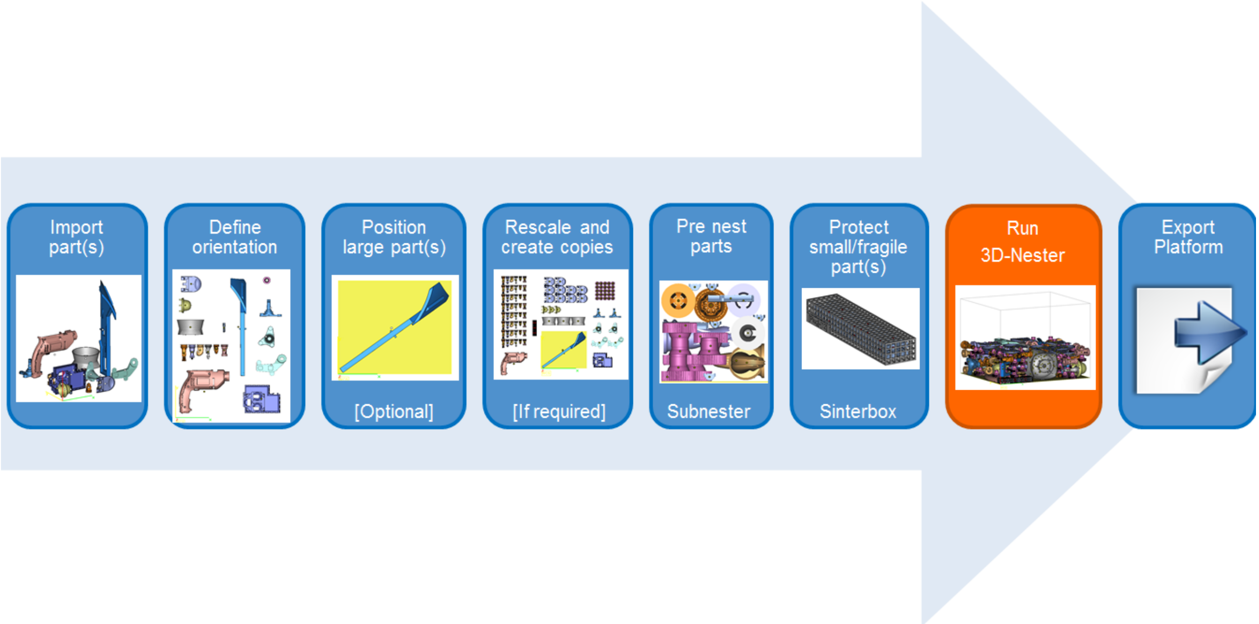
At the same time, the software ensures that none of the parts collides with either another part or with the container.

A live preview is available during the nesting of your platform. You can exactly follow where parts are placed, which ones still have to be processed and/ or which part(s) don't fit in the build envelope. (E.g. part is too large, platform is already fully loaded, …)

The Magics 3D Nester is designed so that any type of user can work with it. Non – advanced users can run it by a single click using the included 'Fit to platform' profile, advanced users can create profiles and use them to run the 3D Nester.



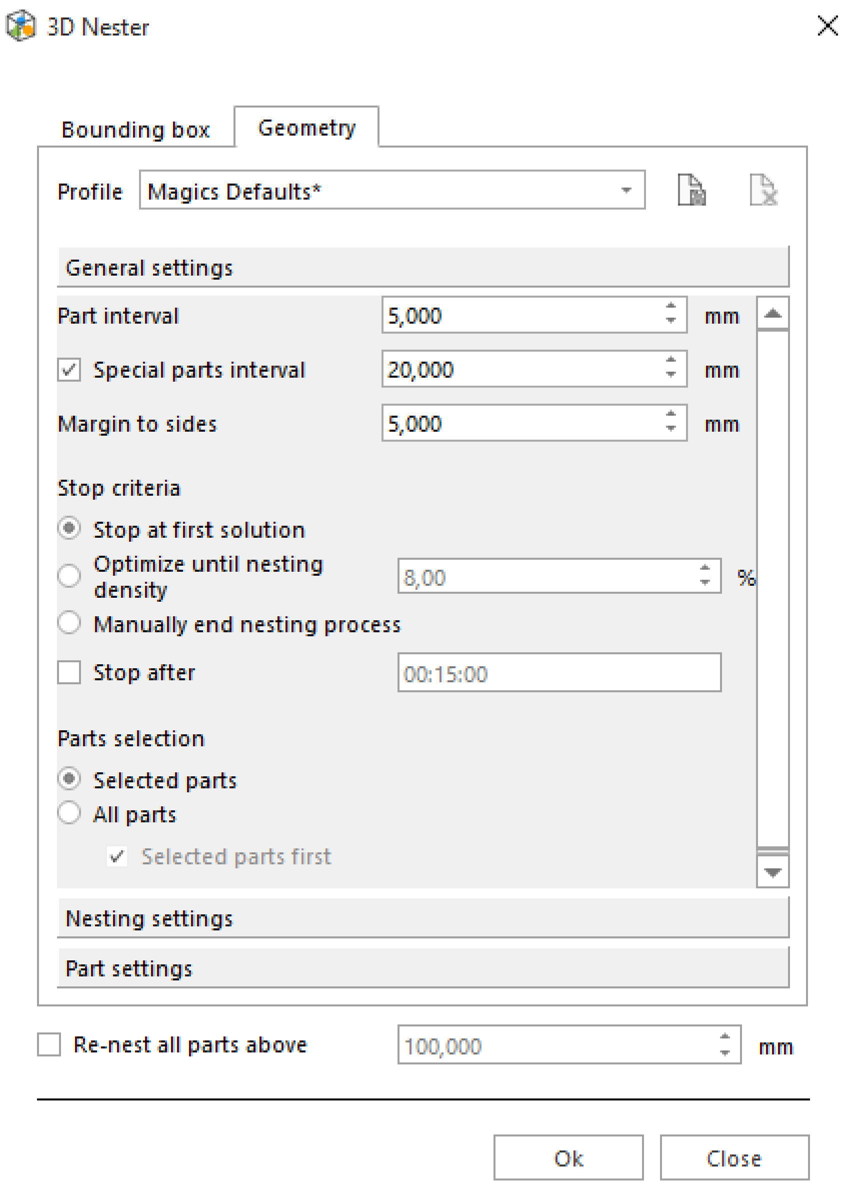
## 2.3.2 Workflow




— Import part(s)
— Define orientation
— Position large part(s)
— Create virtual copies
— Pre nest parts
— Protect small/ fragile part(s)
— Run 3D Nester
— Export platform

*Remark*: More information on the other items within the workflow can be obtained during one of our training sessions.

## 2.3.3 3D Nester




### 2.3.3.1 *Profile*

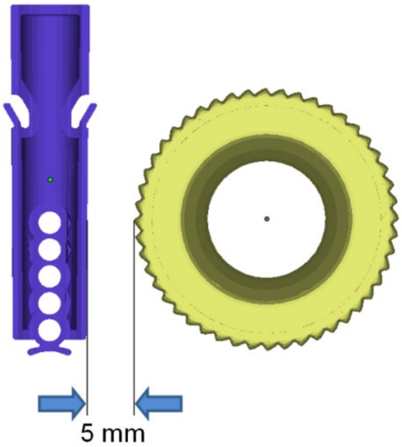
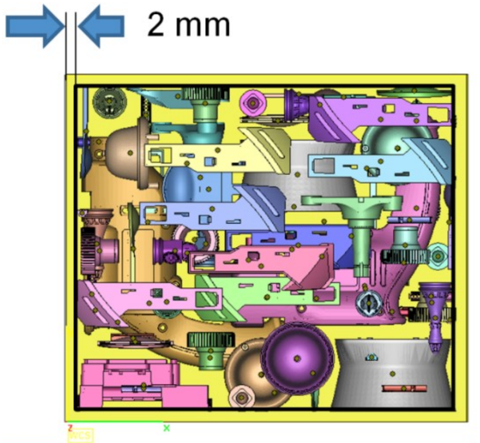
To make it as easy as possible to work with the 3D Nester, profiles can be created.

A default profile with default nesting values is always available for selection. This is called “Magics Defaults”. If any value of “Magics Defaults” is changed, this setup can be saved to a new profile.

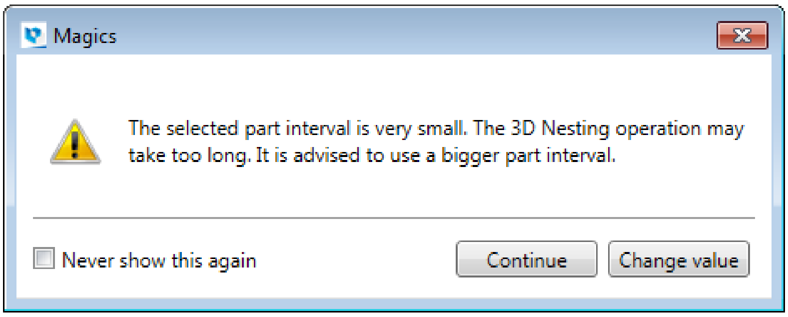
If the parameters are modified while a profile is selected, this profile will be marked with a *. The changes will become permanent if the profile is saved again.

### 2.3.3.2 *Interval settings*

Clearly define the interval between the parts and the margins from your platform.

| | |
|---|---|
| Part interval | This value refers to the minimal distance between two parts (pre-processing).   |
| Margin to sides | This is the minimum distance to the building envelope of the machine, selected in the Machine Setup.   |

*Remark*: A warning message is shown when the chosen part interval is smaller than 4 mm.



### 2.3.3.3 Stop criteria

The 3D Nester provides 3 different types of stop/ end criteria, which can be combined with a defined time frame.

| | |
|---|---|
| Stop at first solution | The nesting will be ended as soon as all parts are processed and packed inside the build envelope. |
| Optimize until nesting density …% | Choosing the second option, the nesting will end when the predefined nest density is reached.<br><br>The nest density is calculated according to the following formula:<br><br>$\boxed{ND = \frac{Volume\ all\ parts}{Pa * Z\ pos_{highest\ part}} * 100\%}$<br><br>*ND: Nest Density*<br>*Pa: Platform area*<br>*Z pos: Z position*<br><br>*Remark: Parts are only taken into account when the center of the part lays inside the platform bounds* |
| Manually end nesting process | The user manually ends the nesting process based upon the nesting height and nesting density visible.<br>At this moment the current status of the nesting can be kept. |
| Stop after | When checked, one can enter a duration in hours, minutes and seconds the nesting may maximally take. |
| Advanced options | The advanced options provide additional prameters to define the nesting.<br>See Nesting settings, page 490 |

Remark: Independently of which stop criteria is chosen, the 3D Nester will always perform an interlocking test at the end.

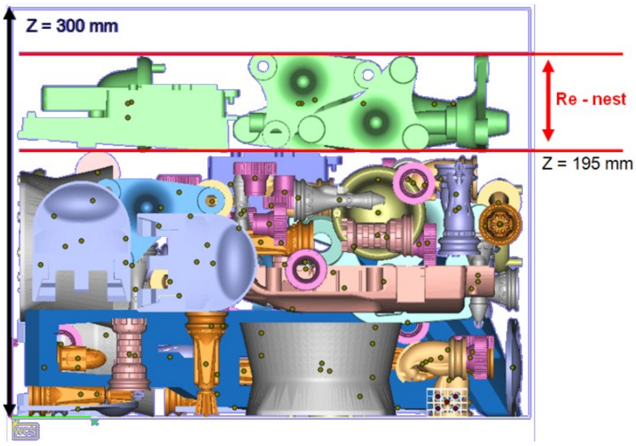
### 2.3.3.4 Part selection

| | |
|---|---|
| Selected parts | Only the selected parts in the part list are taken into account during nesting.<br>Unselected parts are considered by 3D nester as 'locked parts' by default. |

| | |
|---|---|
| All parts in scene | All parts loaded into the scene are taken into account during nesting. |
| Selected parts first | Part loaded in a scene, which are selected will be nested first. These are parts with a higher priority next to the others. |

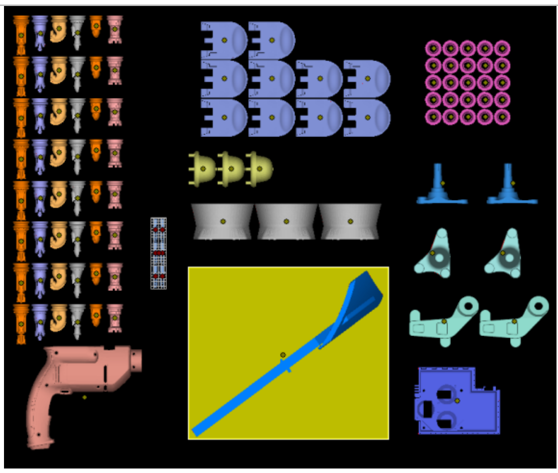
### *2.3.3.5 Re-nest parts above*

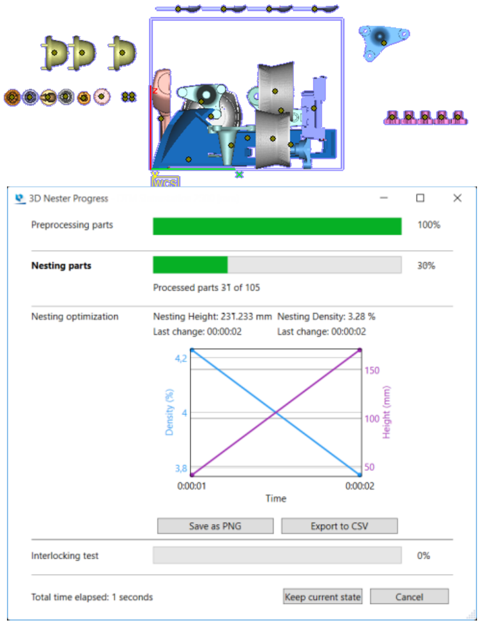
Add parts to your already nested build

| | |
|---|---|
| Re – nest all parts above … mm | Nest additional parts above a specified Z – height even if your build is already launched.<br><br>*Re-nest all parts above = 195 mm*<br><br><br> |

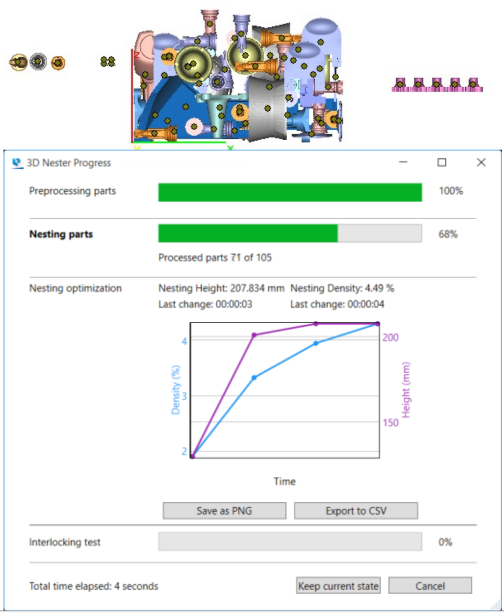
## 2.3.4 Run 3D Nester

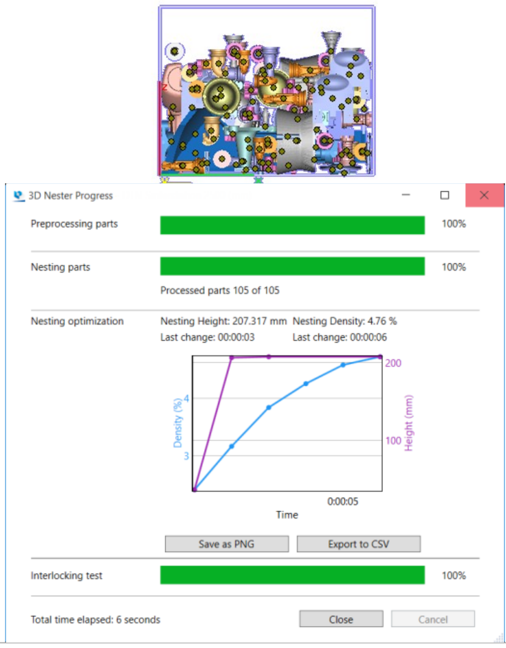
| | |
|---|---|
| Start position | *Processed parts*: 11 of 105 |



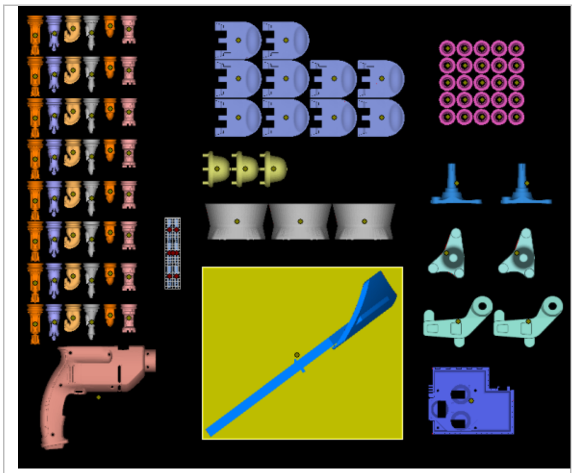
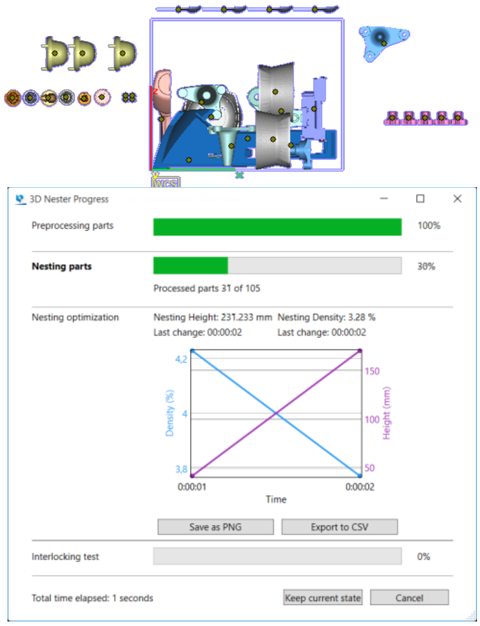
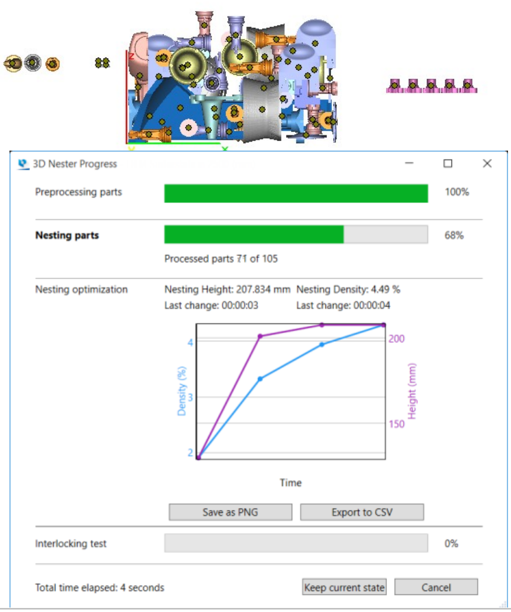
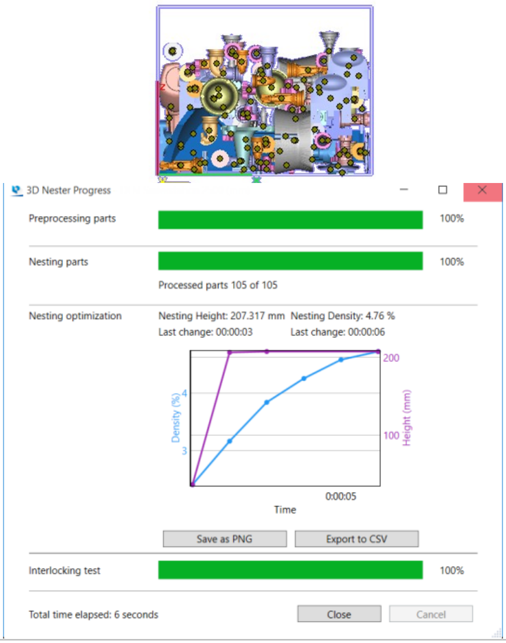



| *Processed parts*: 72 of 105 | *Processed parts*: 105 of 105 |
|---|---|




| Start position | Processed parts: 11 of 105 |
|---|---|

| | |
|---|---|
|  |   |
| Processed parts: 72 of 105 | Processed parts: 105 of 105 |
|   |   |

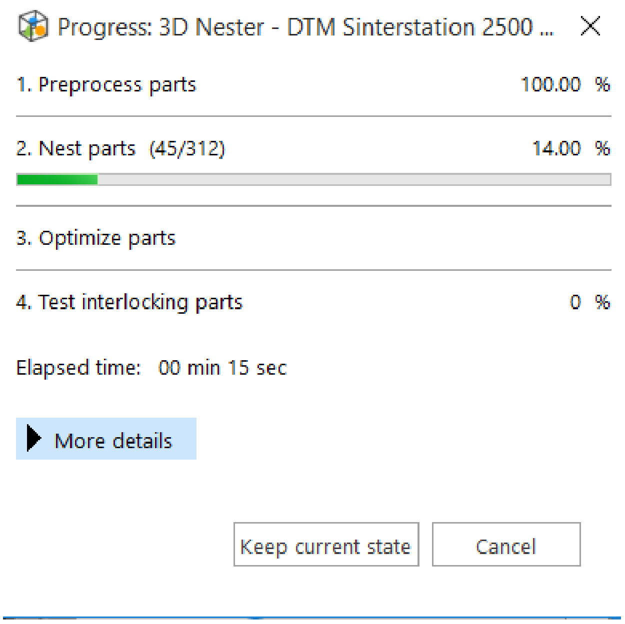
— Nesting properties used

| | |
|---|---|
| Part interval | 5 mm |
| Margin to sides | 2 mm |
| Stop criteria | Stop at first solution |
| Freedom of parts | - Rotate 90° and translate |

| | |
|---|---|
| | - Fix bottom plane and xy |

### *2.3.4.1 3D Nester Progress*

During the nesting, the progress is shown by different progress bars. The nesting is divided into 4 different steps. For every step an indication is shown of the already performed action.



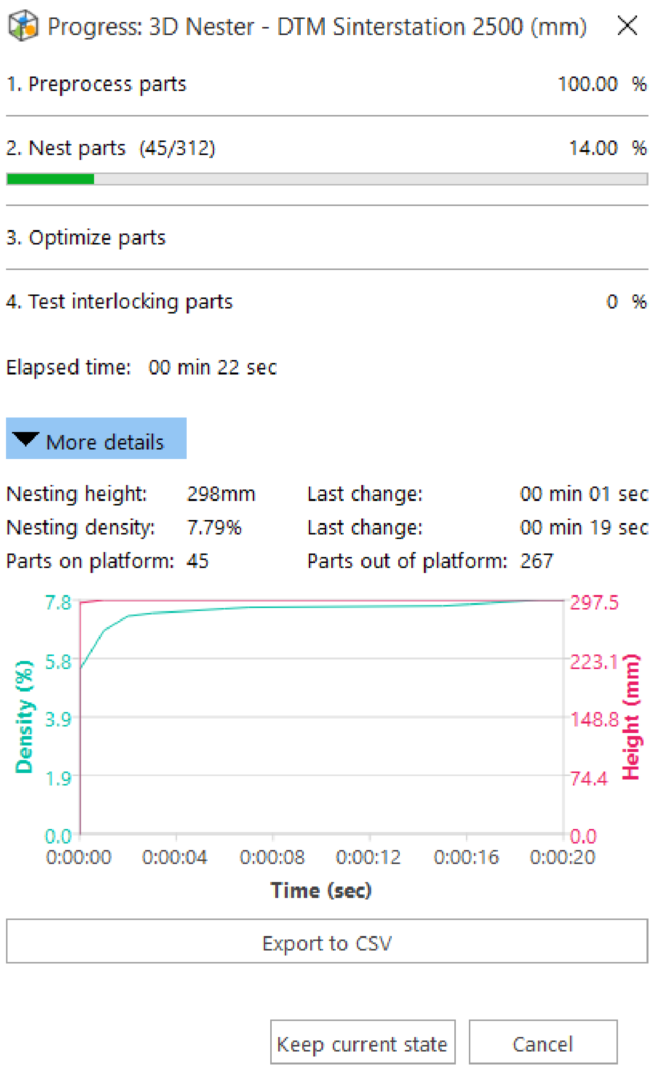

#### 2.3.4.1.1 Step 1: Preprocessing parts

Parts are being analyzed before the actual nesting is taking place. During preprocessing, the parts are removed from the platform build envelope.

#### 2.3.4.1.2 Step 2: Nesting parts

The actual nesting of parts takes place in this step. During nesting the following information is displayed

- Number of parts that are already processed/ nested
- Total amount of parts that must be nested
- Amount of parts placed outside the platform boundaries (failed parts)
- Nesting density
- Nesting height
- A graph showing the evolution of nesting density and height in real time




The graph can be managed during nesting in the following way:

| Action | Result |
|---|---|
| Click + hold left mouse button and move the mouse | Selects a certain period of time from the chart to visualize in more detail |
| Scroll mouse wheel | Zoom in/out of the chart |
| Double left click | Zoom out to the main view of the chart |
| Hover with the mouse over the points on the charts | The density/height values at the indicated time on the chart are shown |
| Save as PNG | Exports a PNG of the chart |
| Export to CSV | Exports the values of the chart to a CSV file |

#### 2.3.4.1.3 Step 3: Nesting optimization

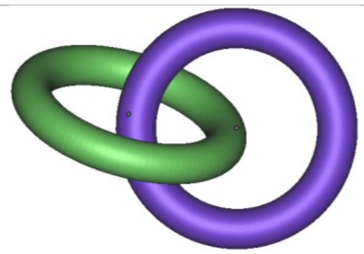
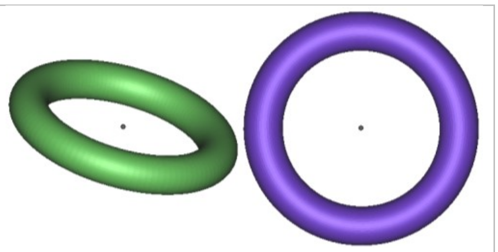
Depending on the chosen ‘Stop criteria’, the 3D nester further optimizes the nesting. During this optimization the nesting height is lowered, together with an increase of the nest density.

#### 2.3.4.1.4 Step 4: Interlocking test

During the final step an interlocking test is performed.

Interlocking means that 2 (or more) parts cannot be separated due to the positions they are nested in. If interlocking is detected, the progress bar will color red and all suspected interlocking parts are visualized, while the other parts are hidden.

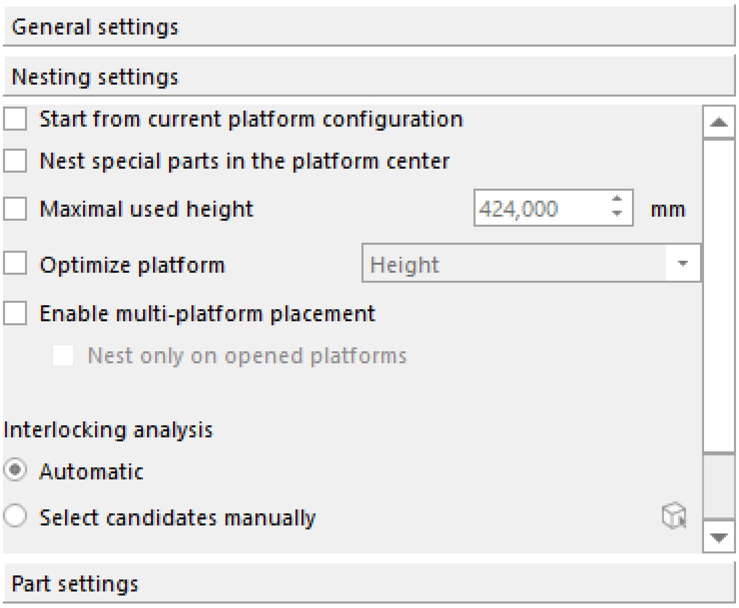
An action is required if interlocking exist. Possible actions could be: perform a new nesting, remove one of the problem parts from the platform, translate/ rotate one of the problem parts,…

| | |
|---|---|
|  |  |
| Interlocking | No interlocking |

### 2.3.5 3D Nester advanced options

Utilize the advanced nesting settings to further optimize your result. Use the nesting and part settings to re-nest your build(s) from a certain position even if it is already launched, use another part interval for special parts and/ or set different translation/ rotation properties per part.

#### *2.3.5.1 Nesting settings*




— Start from current platform configuration

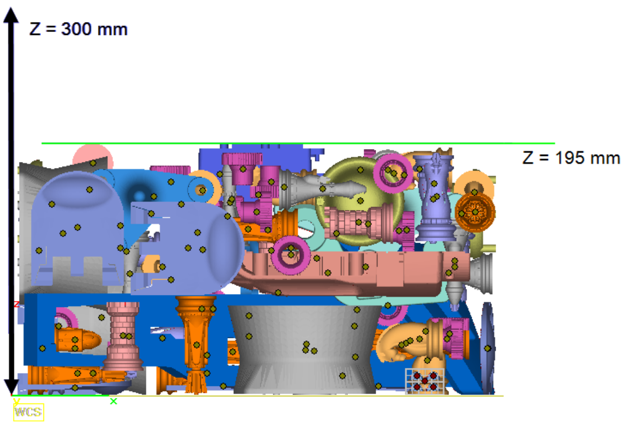
When checked, the 3D nester will start from the current platform configuration: all parts that are within the build envelope will remain there. They might still move around during the optimization phase.

— Nest special parts in the platform center

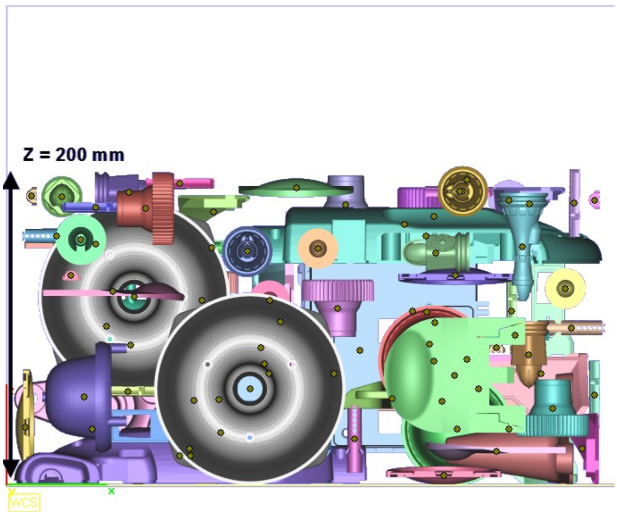
When checked, you are able to assign priority to special parts and nest them automatically in the platform center.

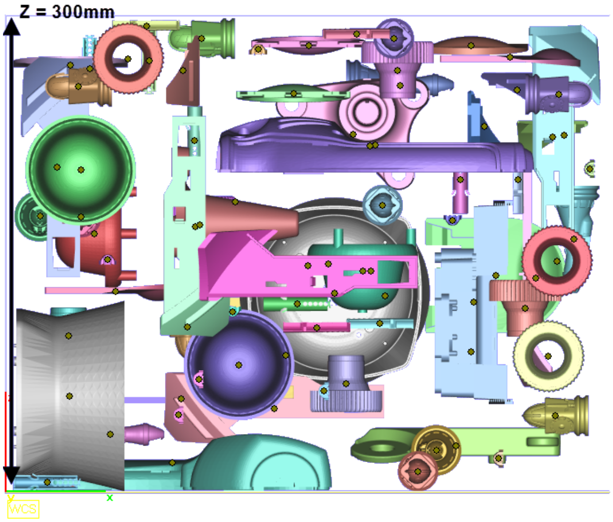
— Build height

| | |
|---|---|
| Maximal used height | The maximal used height is the height used during nesting. By default the height, specified in the machine setup, of the selected machine is used.<br>This value can be changed though obviously this value must be smaller than the real height of the building envelope. |

| | |
|---|---|
| | *Maximal used height is 195 mm*<br> |

— Distribute parts

| | |
|---|---|
| Distribute parts in height | The parts on the platform are uniformly distributed over the specified height. |
| | *Maximal used height = 200mm*<br><br>*Maximal used height = 300mm* |

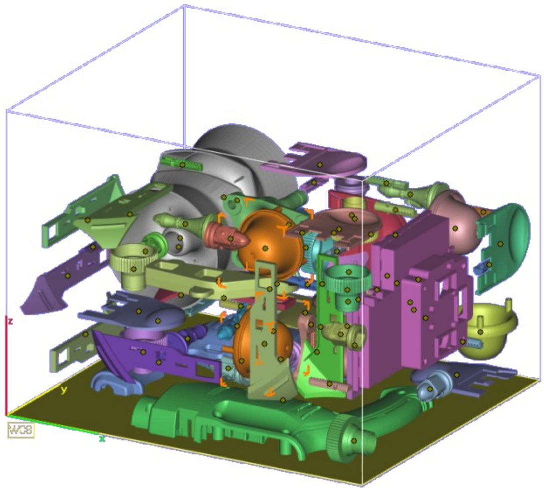
| | |
|---|---|
| |   |
| Optimize slice volume (*) | The volume of the slices is made as identical as possible amongst the maximal used height of the platform. |
| Optimize slice volume and height (*) | The volume of the slices is made as identical as possible and the height of the platform is brought back to its minimum.<br>This calculation method will take some more time than the other options. |

— (*) See ‘Check slices distribution’ for additional information.

— Avoid interlocking

The 3D nester has an option to avoid interlocking of parts during nesting. You can either choose to let Magics try to detect all parts that can cause interlocking or you can help by indicating the parts which are candidates for interlocking manually. This second option will be faster. If you choose not to use this option, an interlocking test will still be performed after the nesting operation. If interlocking is detected after nesting, you will have the option to renest the parts that are interlocking to solve the issue.

| | |
|---|---|
| Define candidates manually | Option to manually indicate which parts are candidates for interlocking. The nester will use this information to avoid interlocking with these parts. The manually selected candidates are colored in “orange”. |

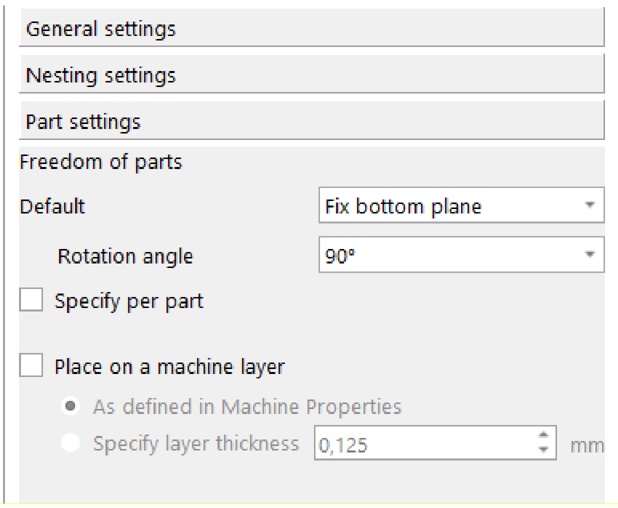
| | |
|---|---|
| |  |
| Automatic | When this option is checked the 3D nester will try to analyze all parts and identify the ones that can cause interlocking. This information will be taken into account during nesting. |

— Enable multiplatform placement

The 3D nester can calculate and distribute the parts between different parts.

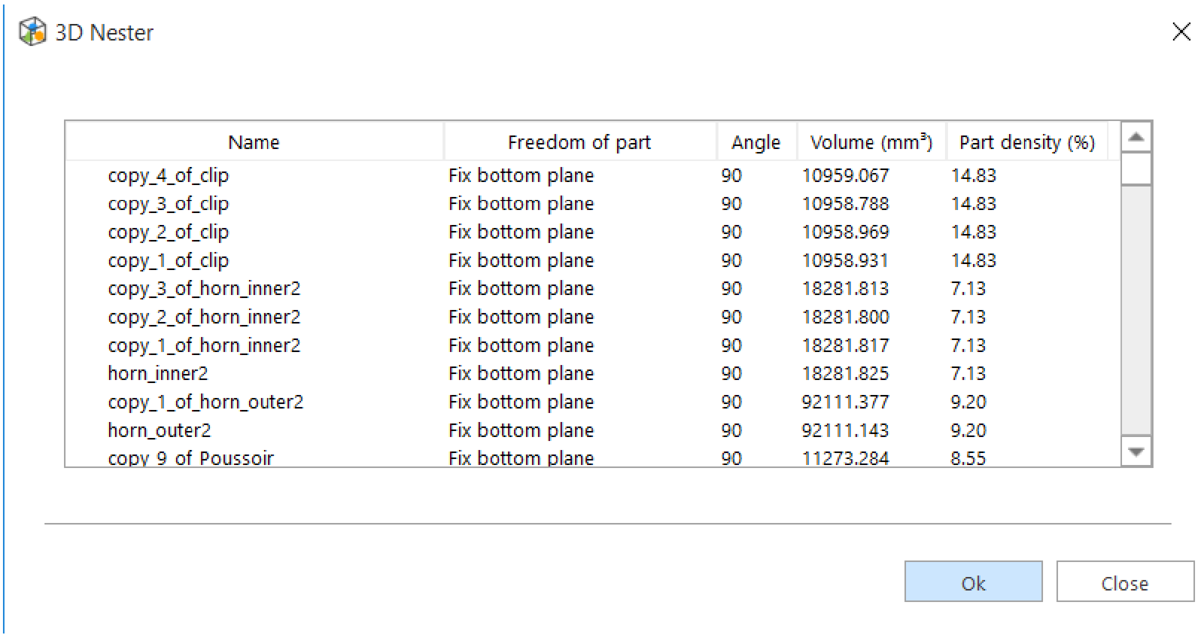
| | |
|---|---|
| Nest on opened platforms | The parts will only be nested on opened platforms. |

#### 2.3.5.2 *Part settings*



#### 2.3.5.2.1 Freedom of parts

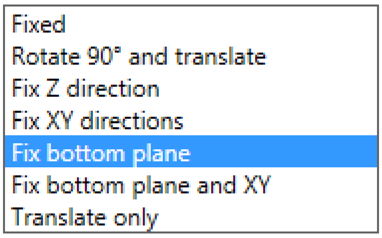
| | |
|---|---|
| Default | Specify which type of freedom for parts is used during nesting and this for all involved parts.<br>More information on the different types can be found below 'Possible restrictions'. |
| Specify per part | Add different translation/ rotation restrictions to all your parts individually. |




| | | |
|---|---|---|
| List | This list displays all the parts of the part list and their respective freedom. | |
| | Part Name | The name of the part. |
| | Freedom of Parts | The freedom of the part, this freedom can be restricted. |
| | *The freedom of part can be modified by double clicking on it and selecting the wanted value from the drop down. The angle can be modified as well for the freedom of parts that support it.* | |
| | Volume, mm³ | The total amount of volume of the part |

| | | |
|---|---|---|
| | Part density, % | Also known as packing factor.<br>$$PD = \frac{PVol}{BBVol} * 100\%$$<br>*PD: Part density*<br>*PVol: Part volume*<br>*BBVol: Bounding box volume* |

### 2.3.5.2.2 Possible restrictions



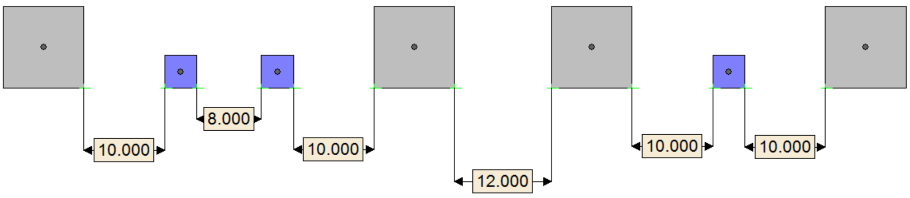

| | |
|---|---|
| Fixed | The part will be completely fixed, meaning no rotation or translation will be done with the part. |
| Rotate 90° and translate | The part is rotated with steps of 90°, translation is free. |
| Fix Z direction | The part will only turn around the X and Y axis with angles of 180° and will rotate freely around the Z axis, translation is free.<br>Around the Z-axis, the part can rotate by 15°, 30°, 45° or 90° |
| Fix XY directions | The part will turn around the Z axis with steps of 180°, the parts X-Y direction doesn't change, translations are free. |
| Fix bottom plane | The part will only turn around the Z axis, translation is free.<br>Around the Z-axis, the part can rotate by 15°, 30°, 45° or 90° |
| Fix bottom plane and XY | The part will only turn around the Z axis with steps of 180°, translation is free. |
| Translate only | The part will only be translated. |

| | *Rotation Around axis* | | | *Translation Direction* | | |
|---|---|---|---|---|---|---|
| | X | Y | Z | X | Y | Z |
| Rotate 90° and translate | 90 | 90 | 90 | Yes | Yes | Yes |
| Fix Z direction | 180 | 180 | 15°<br>30° | Yes | Yes | Yes |

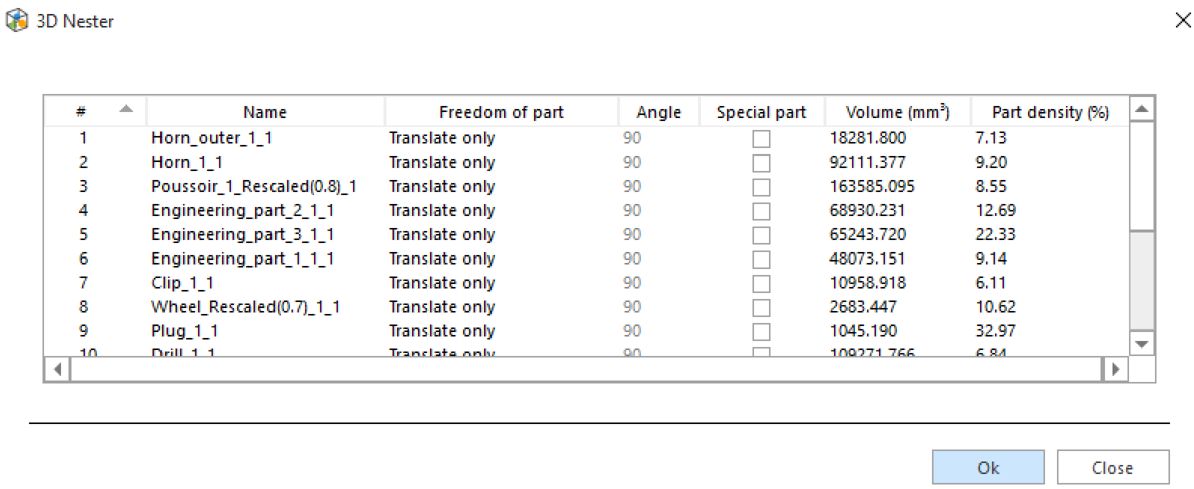
| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 45°<br>90° | | | |
| Fix bottom plane | No | No | 15°<br>30°<br>45°<br>90° | Yes | Yes | Yes |
| Fix X-Y directions | 180 | 180 | 180° | Yes | Yes | Yes |
| Fix bottom plane and X-Y | No | No | 180 | Yes | Yes | Yes |
| Translate only | No | No | No | Yes | Yes | Yes |
| Fixed | No | No | No | No | No | No |

### 2.3.5.2.3 Set different interval for special parts

| | |
|---|---|
| Special parts interval | Define different part intervals based on the size of the parts.<br>Large or dense parts preferably use a special part interval. |




— Normal part interval = 8 mm
— Normal - large interval = 10 mm
— Large interval = 12 mm

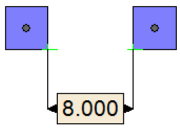


| | | |
|---|---|---|
| List | This list displays all the parts of the Part List | |
| | Name | The name of the part. |
| | Special part | Check to indicate the special parts |
| | *The freedom of part can be modified by double clicking on it and selecting the wanted value from the drop down. The angle can be modified as well for the freedom of parts that support it.* | |
| | Volume, mm$^3$ | The total amount of volume of the part |
| | Part Density, % | Also known as packing factor.<br>$\boxed{PD = \frac{PVol}{BBVol} * 100\%}$<br>*PD: Part density*<br>*PVol: Part volume*<br>*BBVol: Bounding box volume* |

### 2.3.5.2.4 How is it working?

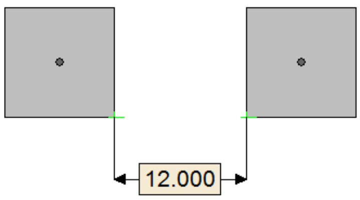
- Normal interval

The normal interval is equal to the specified value at the part interval.

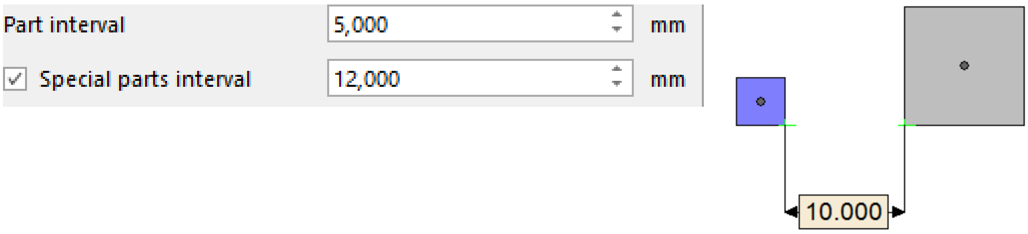

- Large interval

The large interval is equal to the specified value at the special parts interval.

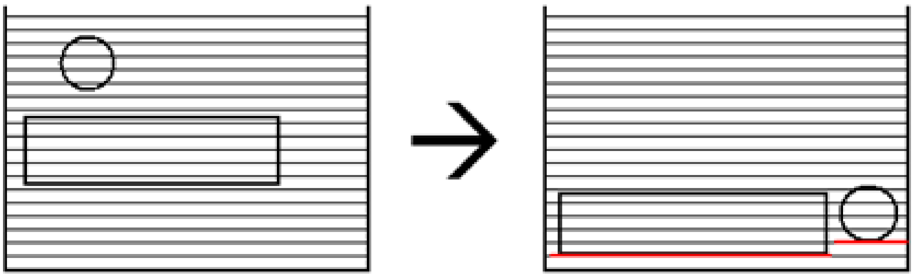




- Normal – Large interval

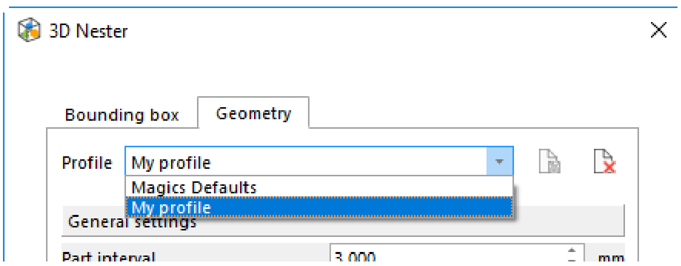
The normal – large interval is equal to the average of the part interval and the interval for special parts.




### 2.3.5.2.5 Parts on machine layer

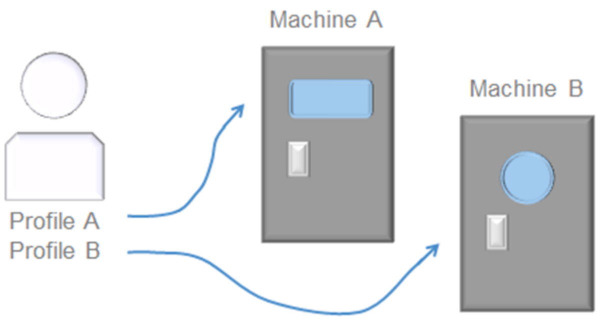
| | |
|---|---|
| Place on a machine layer | Parts are slightly post-shifted so that the minimal z-coordinate of each part is located precisely on a layer of the machine. |
|  | |
| Get from machine properties | The layer thickness defined in the machine library is taken into account when placing parts at the layers |
| Specify | Manually specify the layer thickness to use when placing parts on the layers |

## 2.3.6 3D Nesting Profiles

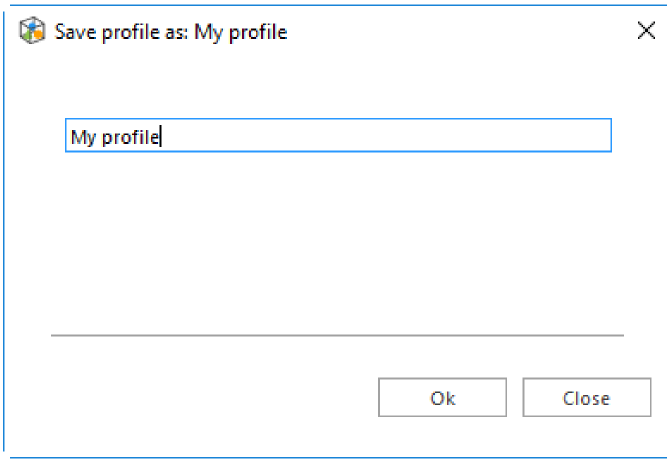



The 3D Nester gives you the possibility to work with different profiles. These profiles must be created once and can then be transferred amongst others.

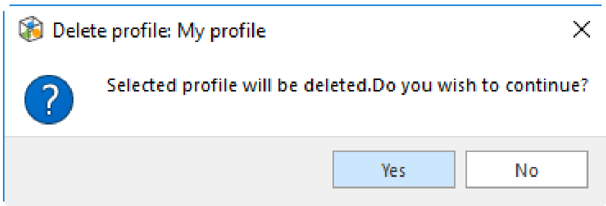
For non – advanced users it is easy to nest parts since only the correct profile has to be chosen; for the advanced users it might be a time saving since the parameter defining only has to be done once.




Once all parameters are defined in the 3D Nester the profile can be saved easily by pressing the ‘Save profile’ button: just input the profile name and click OK button.




To remove profiles, click on the ‘Delete profile’ button in the 3D Nester dialog box, and confirm the profile deletion.



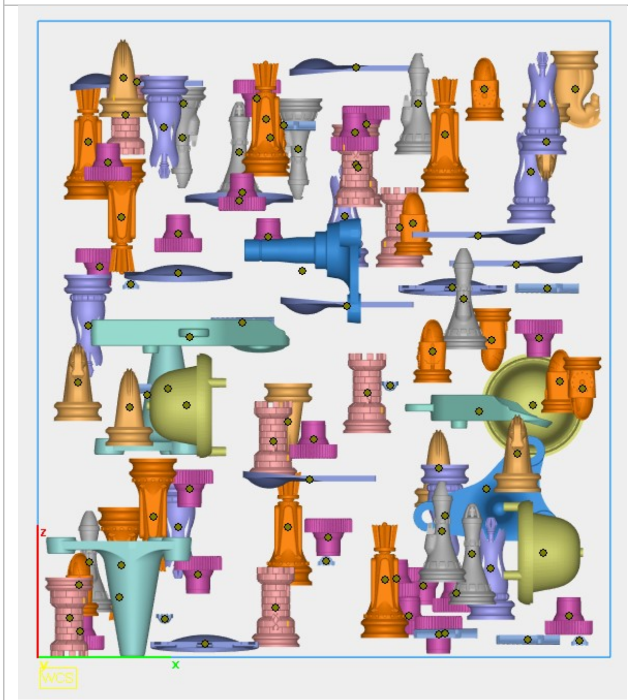
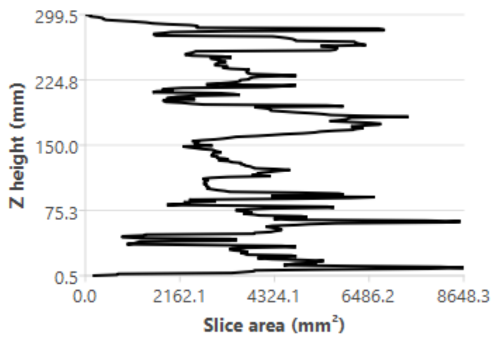

### 2.3.6.1 *Transfer profiles*

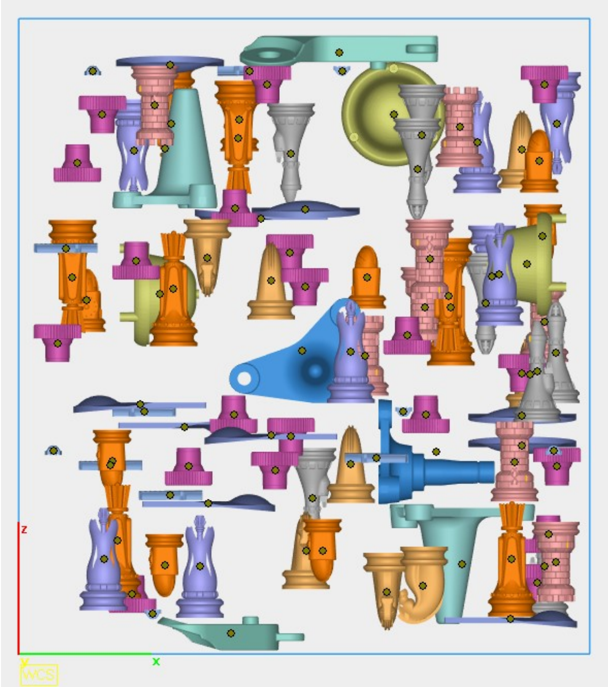
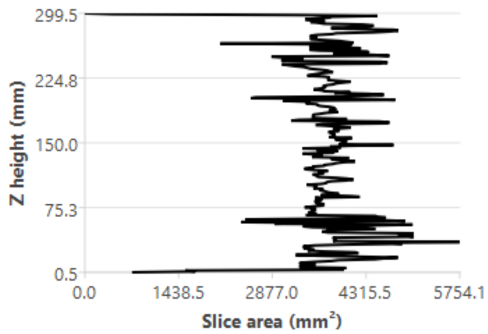
Profiles can easily be transferred to other systems via the Magics profile. The profile has to be created on one system and can then be exported. To use these profiles on another system, the profile has to be imported again.

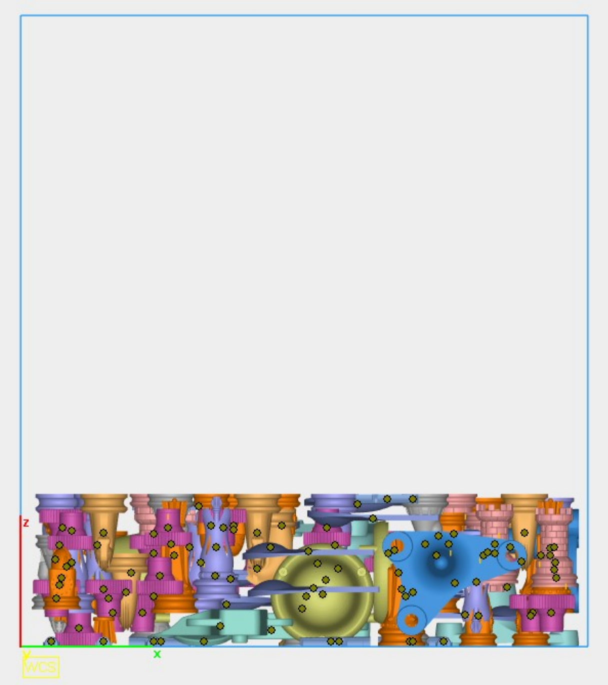
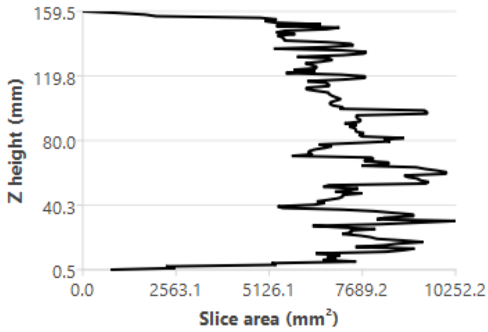
## 2.4 Check slices distribution

The slice distribution chart gives you the possibility to analyze the surface area for each layer and distribution within your build. Less difference between the layers will increase the build quality.

There are 2 options within the 3D nester dialog that have an influence on the slices distribution graph. (3D Nester – Nesting settings – Optimization criteria)

<table>
<tr><th colspan="2">Distribute in height</th></tr>
<tr><td></td><td>Maximal used height:<br>Complete build height<br><br>Part interval: 5mm<br>Margin to sides: 5mm</td></tr>
<tr><td>
</td><td>Distribution<br>Smooth curves<br>Peak size<br>Amount of peaks</td></tr>
</table>

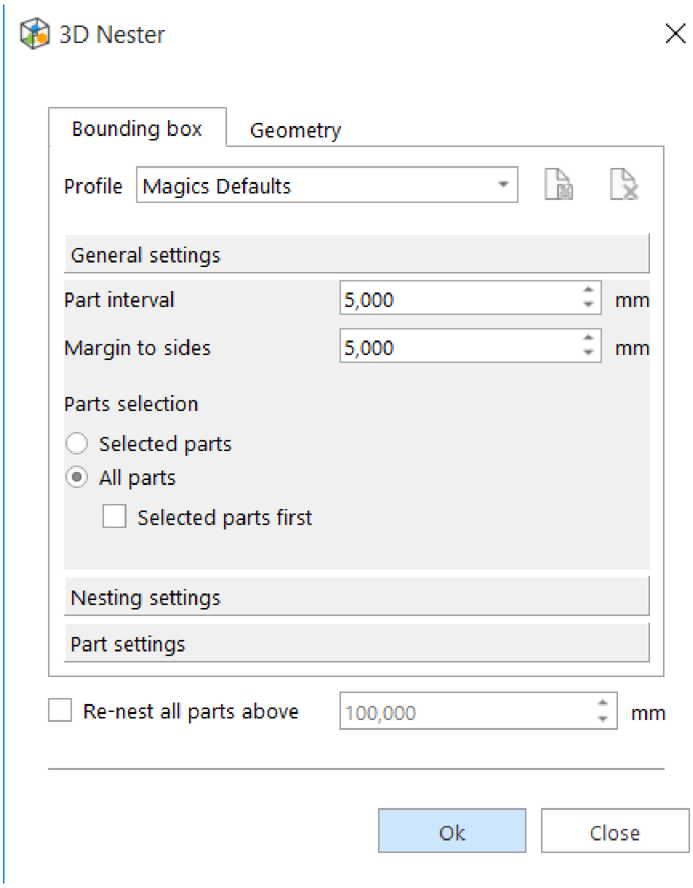
| *Optimize slice volume* | |
|---|---|
|  | *Maximal used height:*<br>*Complete build height*<br><br>*Part interval: 5mm*<br>*Margin to sides: 5mm* |
|  | + Distribution<br>− Smooth curves<br>+ Peak size<br>− Amount of peaks |

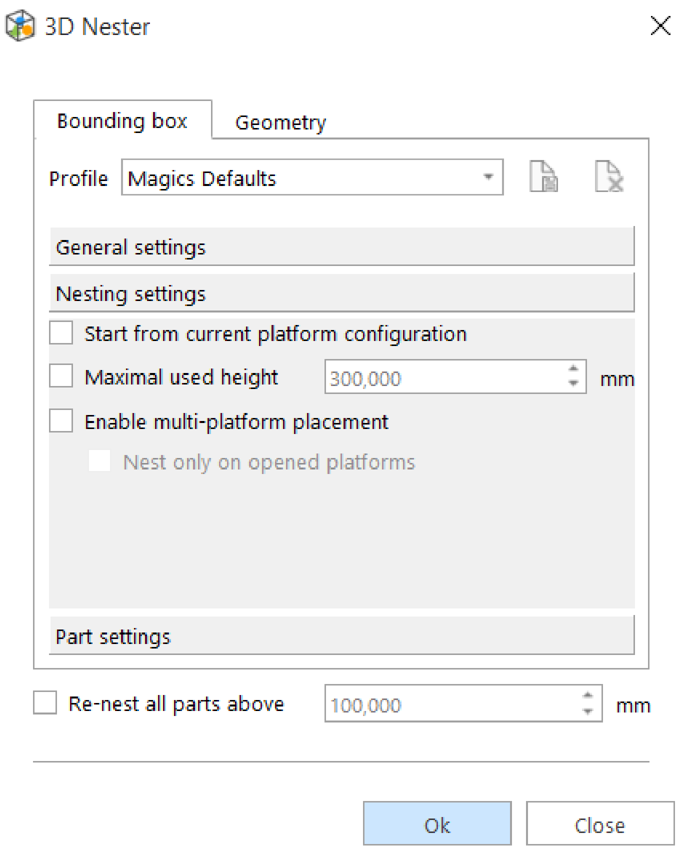
| *Optimize slice volume and height* | |
|---|---|
|  | *Maximal used height: Complete build height*<br><br>*Part interval: 5mm*<br>*Margin to sides: 5mm* |
|  | + Distribution<br>+ Smooth curves<br>+ Difference between top/ bottom hills<br>+ Number of hills |

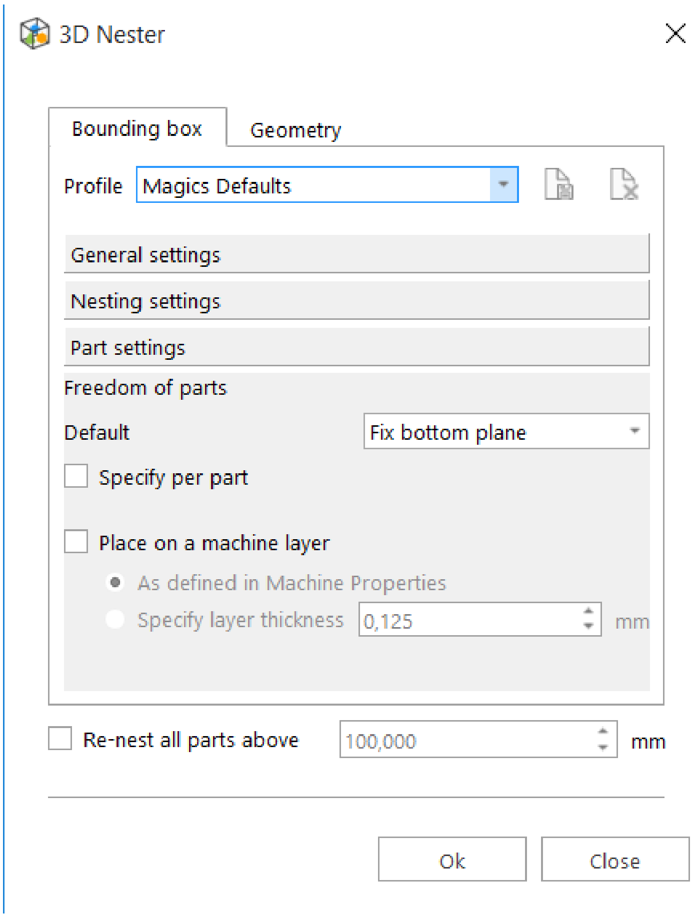
*Remark*: Manual ending of the nesting procedure is needed when using one of the optimization methods.

## 2.5 Nest by Bounding Box

When nesting by bounding box, the algorithm takes into account just the bounding box of the parts when arranging them inside the platform. This type of nesting is favorable for a fast nesting process. All parameters that are used to nest by geometry and can apply for nesting by bounding box are available.

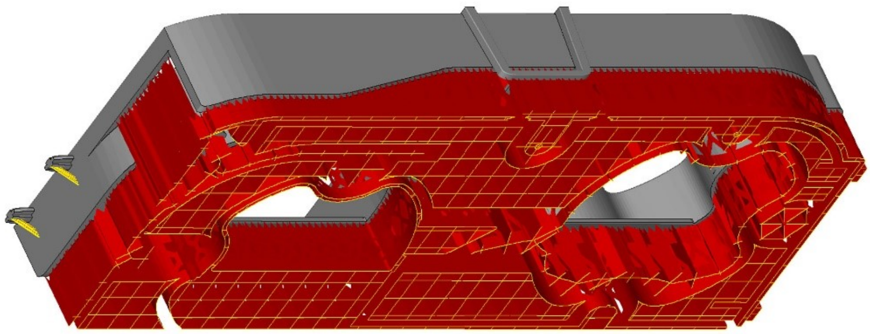

3D Nester
Bounding box
Geometry
Profile
Magics Defaults
General settings
Part interval
5,000
mm
Margin to sides
5,000
mm
Parts selection
Selected parts
All parts
Selected parts first
Nesting settings
Part settings
Re-nest all parts above
100,000
mm
Ok
Close


3D Nester
Bounding box
Geometry
Profile
Magics Defaults
General settings
Nesting settings
Start from current platform configuration
Maximal used height
300,000
mm
Enable multi-platform placement
Nest only on opened platforms
Part settings
Re-nest all parts above
100,000
mm
Ok
Close


3D Nester
Bounding box
Geometry
Profile
Magics Defaults
General settings
Nesting settings
Part settings
Freedom of parts
Default
Fix bottom plane
Specify per part
Place on a machine layer
As defined in Machine Properties
Specify layer thickness
0,125
mm
Re-nest all parts above
100,000
mm
Ok
Close

# 3 Chapter 3: Support Generation

Support generation is central to processes like Stereolithography and metal sintering. Generating support structures quickly and easily is just as crucial in Rapid Prototyping. Final part quality depends on verifying and adapting the supports you've generated. Magics offers several support types and combinations of these different support structures on one surface.



## 3.1 Introduction

Magics RP is equipped with a module for support generation. Support generation is mainly used for Stereolithography. The generated supports are directly compatible with 3D Systems SLA machines using the STL or SLC format or with EOS using the CLI format. The support generator allows you to generate supports for a whole platform and then edit the support on each surface individually. This support generation work routine allows you to easily adapt supports also after the part has been replaced on the building platform.

Support is only needed under certain surfaces. The selection is based upon the selection parameters from the Machine Properties (1: Support generation parameters). Magics selects these surfaces when entering the support generation module (2: Automatic support generation). Once you've arrived in the support generator module, Magics allows you to adapt the support to your needs (3: Modifying surfaces, support types and parameters). The support generation parameters are crucial during the initial automatic support generation but can be modified for each individual support. In the first place you can adapt the construction parameters, which are interactively defined in the Machine Setup. This interactive change applies only to the active support. The active support is the one that is visible on your screen or when you made them all visible, it is the one with a different color (the bad edges color; default yellow). Secondly you can remove parts of the support in 3D or remove and if necessary redraw portions of the support in the 2D-edit window. At last you can save or export the support you've made.

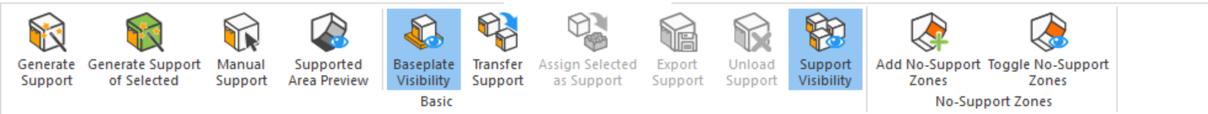
Schematically a support is generated in the following steps:

1. Definition of the selection and the construction parameters in the Machine Setup;
2. Automatic support generation;

3. Modification of the support types and construction parameters;
4. 2D and 3D editing of the supports;
5. Saving and exporting the supports.

There are also special visualization options for the visualization of volume supports.

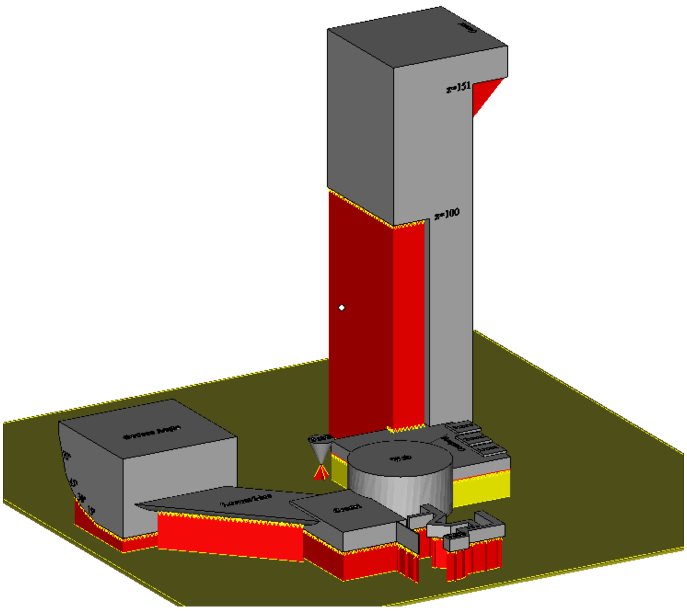
## 3.2 Magics – Support Generation ribbon




### 3.2.1 Generate support


Easily create support structures on your part. Simply choose your platform, place your parts and generate your support.

- one by one
- multiple copies at the same time

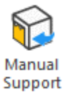


### 3.2.2 Generate support of selected

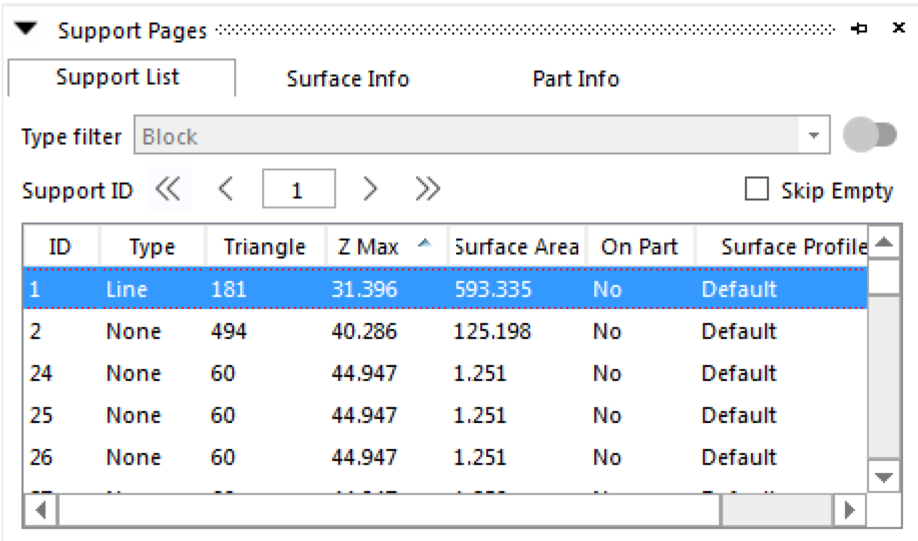

Generate support for selected parts without accessing the support generation module.

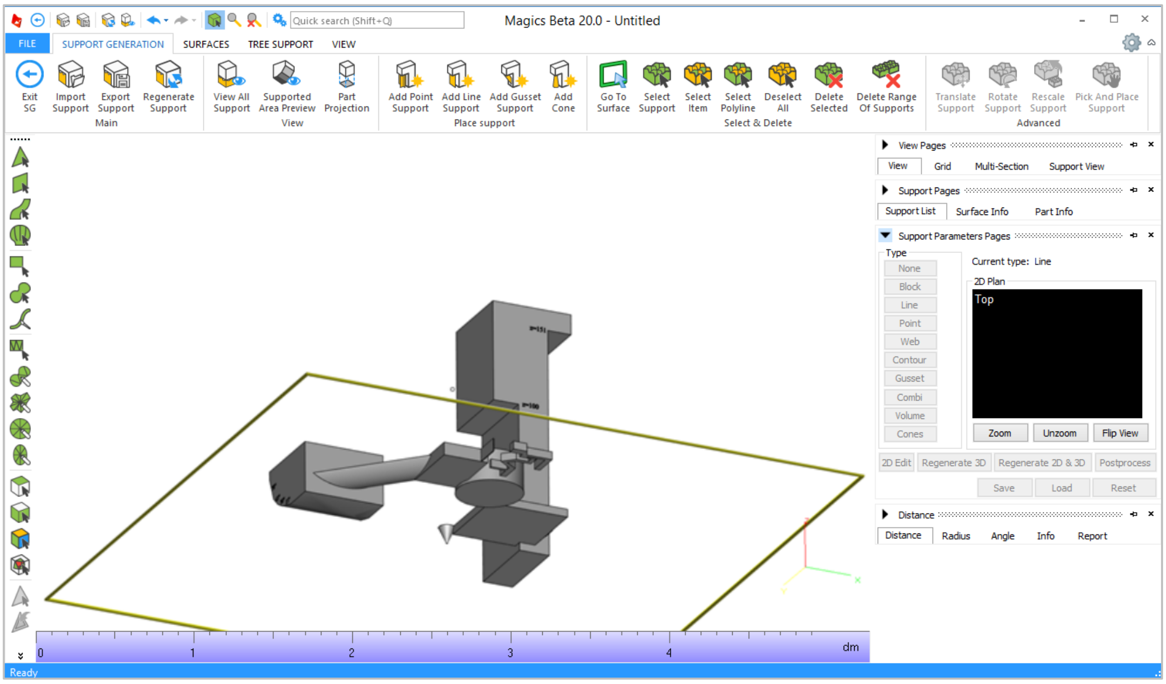
To generate the supports, Magics will utilize the support parameters which are found within the actual platform without entering Support Generation mode.

### 3.2.3 Manual support



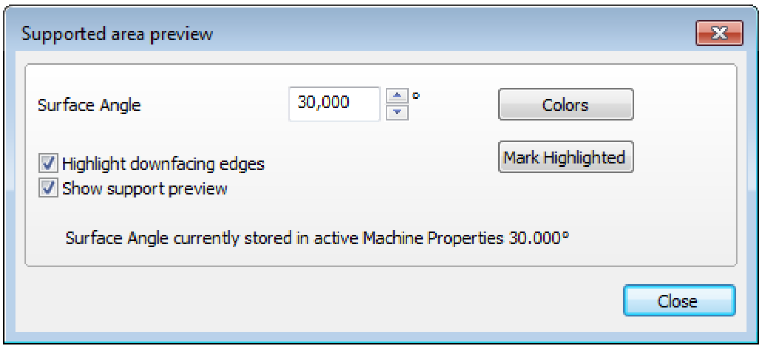

Let Magics subdivide your part into the different surfaces that need support. Within the support generation module you can manually create the needed support structures for the already existing surfaces.



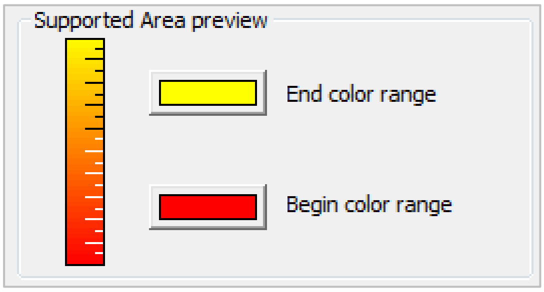


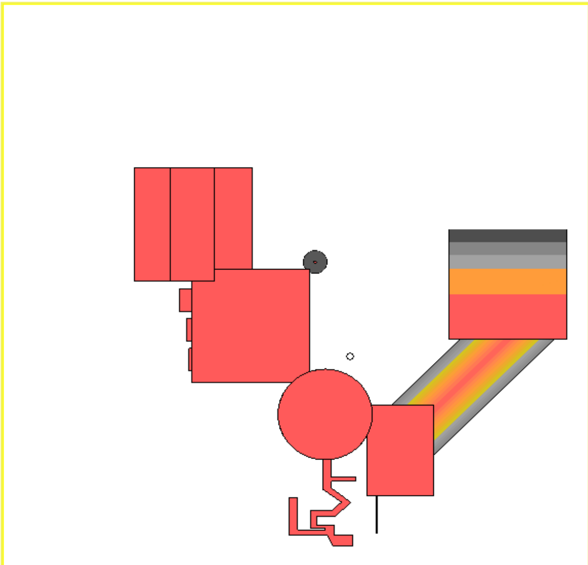

### 3.2.4 Supported area preview

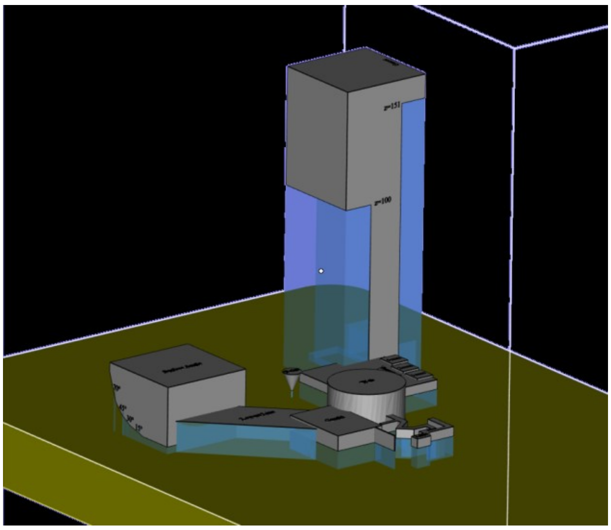

Before generating your support within the support generation module, you can in advance visualize the areas that would need support. Based on the surface angle, the supported areas are indicated with color codes. Additionally it is possible to highlight the down facing edges. When checking the 'Show support preview' checkbox, a provisional display of the support is visualized. At the same time of the visualization you can change the surface angle or re-position your part based on the analysis of the surfaces and edges.




| | |
|---|---|
| Surface Angle | Adjust the surface angle and see immediately on your part how the surfaces that need support change. |
| Colors | Change the colors to visualize the areas which need support |

| | |
|---|---|
| |  |
| Mark highlighted | Marks the highlighted areas. |





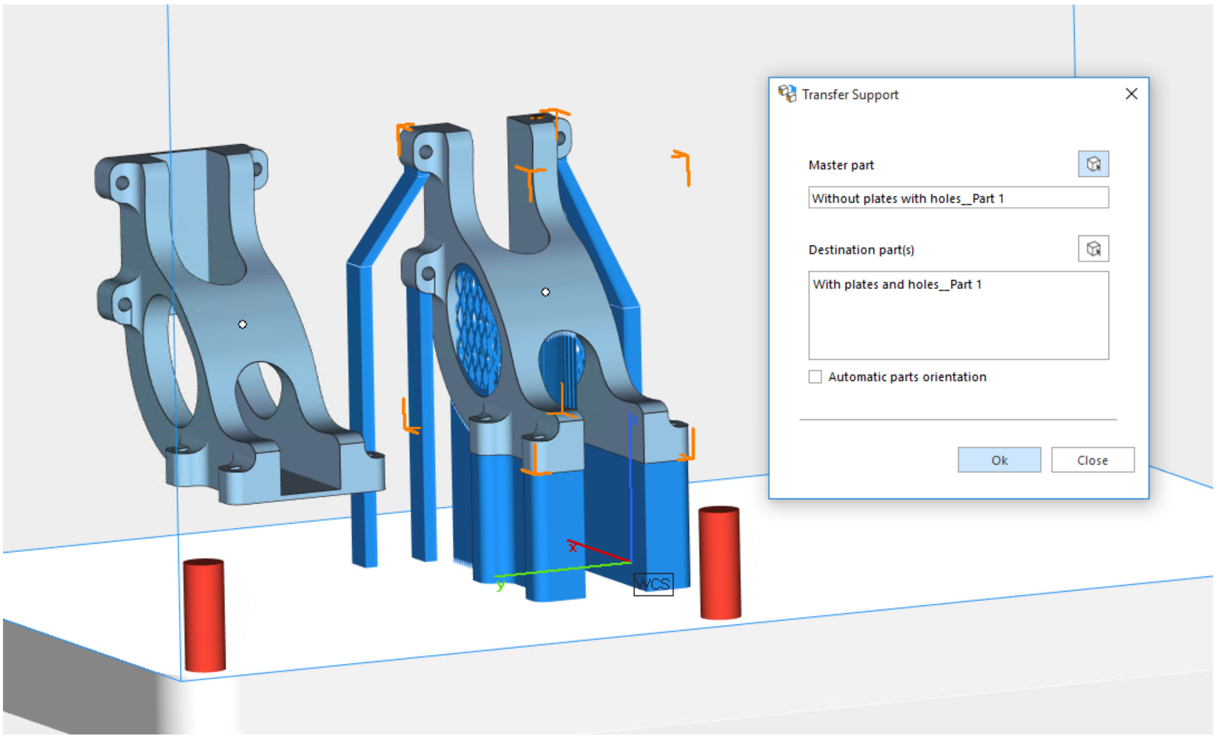
### 3.2.5 Baseplate Visibility


Toggle the visibility of the baseplate

### 3.2.6 Transfer Support

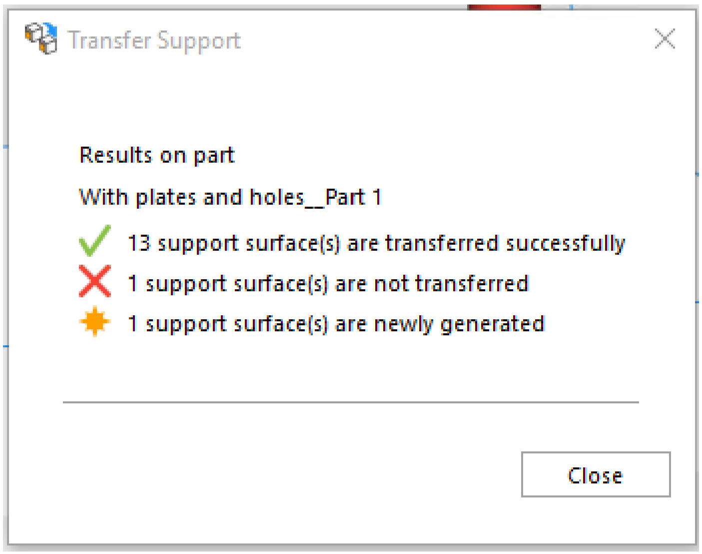
By clicking on transfer support button from the support generation ribbon user can select the “master part” (part with support) and the “destination part(s)”. Automatic orientation will change the orientation “destination part(s)” to “master part”. After clicking on “Ok” button the algorithm will transfer all possible supports.

If the algorithm finds new support surfaces it will generate new surfaces based on automatic supports criteria in machine properties.

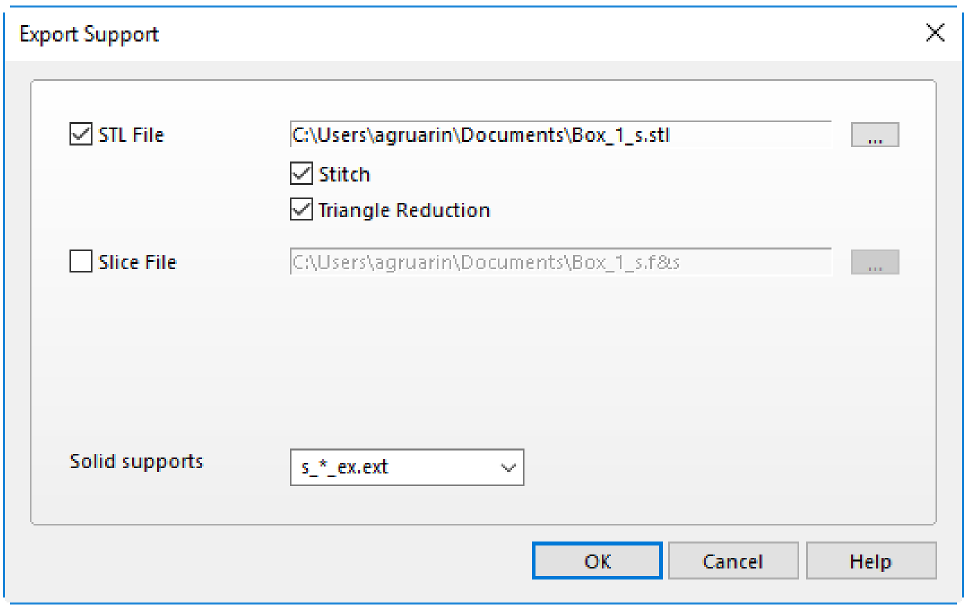



#### 3.2.6.1 *Results dialogue*

This dialogue will show successfully, unsuccessfully and newly generated support surfaces. Unsuccessful supports will be highlighted as red.




### 3.2.7 Export support


<table>
<tr><td rowspan="3">STL File</td><td colspan="2">Export supports as STL files.</td></tr>
<tr><td>Stitch</td><td>Open loops (contours with gaps in it) or gaps in the contours are closed.</td></tr>
<tr><td>Triangle Reduction</td><td>During export a reduction of triangles is performed on the support.</td></tr>
</table>

| | |
|---|---|
| Slice File | Export supports directly as slices.<br><br>*Remark*: Type depends on specifications made in machine properties |
| Solid supports | Select how the file name must be displayed for your machine. |

### 3.2.8 Unload support

Unload generated supports of parts that are selected.

### 3.2.9 Support Visibility

Toggle the visibility of the supports structures for all parts present in the scene.

— For support visualization settings, see paragraph Supports in Settings

### 3.2.10 Add No-Support Zones

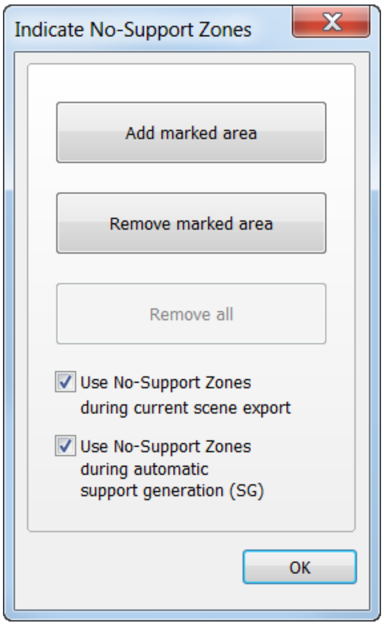
Some parts have surfaces that are very difficult to access and thus present complications for post-processing. Under these circumstances, it may be preferential to prevent supports from being generated in these zones, especially when achieving a higher quality surface finish outweighs a possible deformation due to lack of supports.

**Important remark: In principle, these surfaces require supports to prevent surface deformation and prohibiting the generation of supports in these zones should be avoided as much as possible in combination with automatic support generation (like e-stage).**

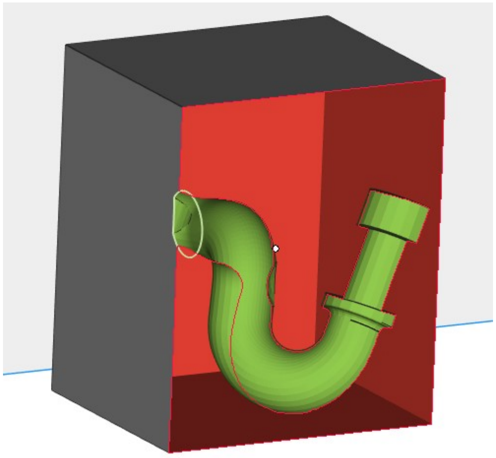
How to create ‘no-support zones’:

1. Press the ‘add No-Support Zones’ icon 

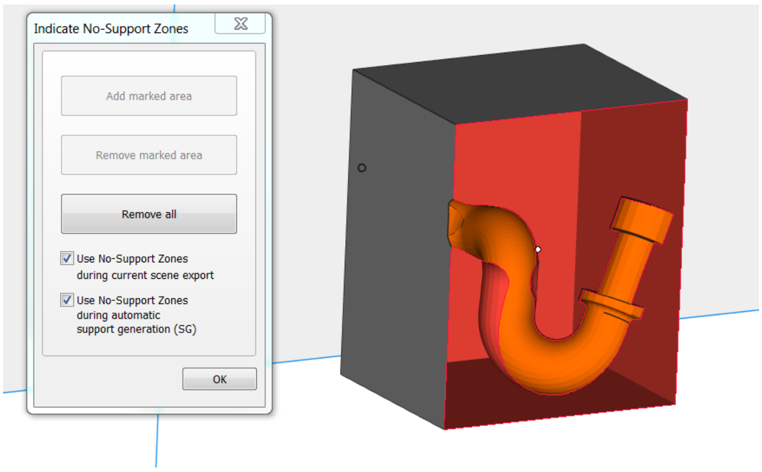
2. The ‘Indicate No-Support Zones’ window will pop up, and the cursor will change into a “marking” cursor. The view and marking tools can also be used to indicate the desired areas.



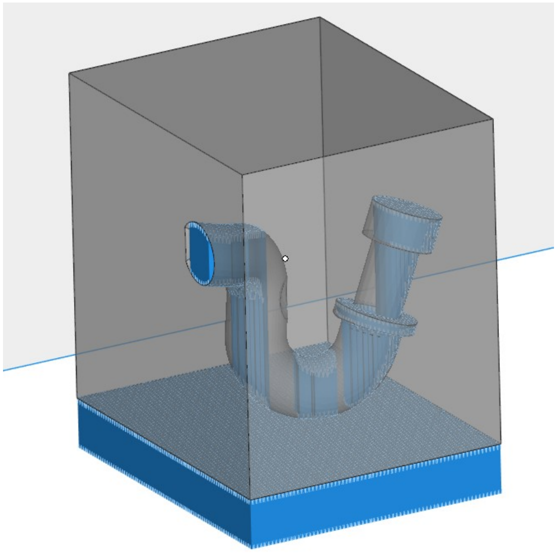

3. Mark the surfaces where no support is required.

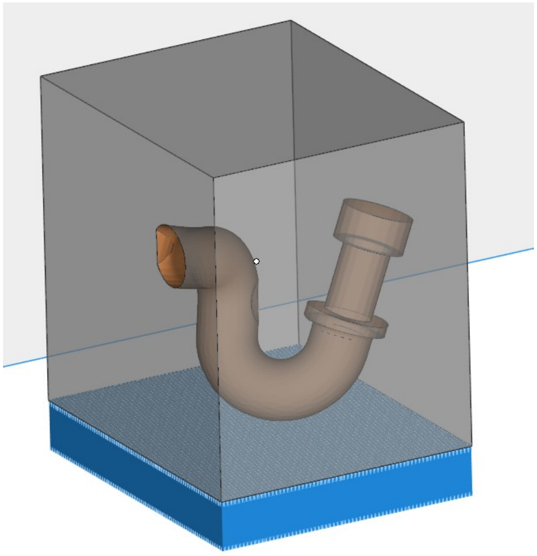


4. Click on 'Add marked are' to define the marked triangles as 'No-Support Zones'. The marked triangles will turn orange.




Depending on the checkboxes that are turned on or off in the ‘Indicate No-Support Zones’ window, SG or E-stage will not generate support on the No-Support Zones. You can see the difference below.



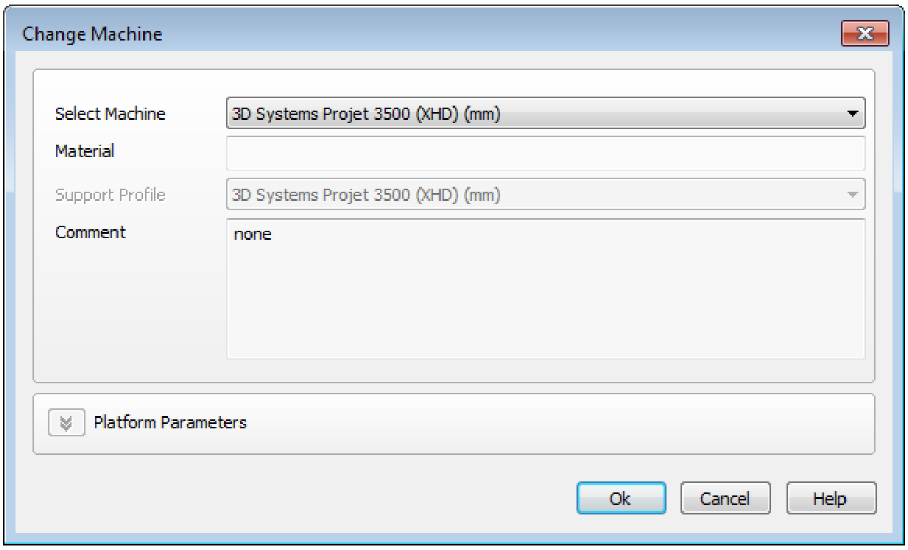


### 3.2.11 Toggle No-Support Zones

 Toggle the visualization of the No-Support Zones.

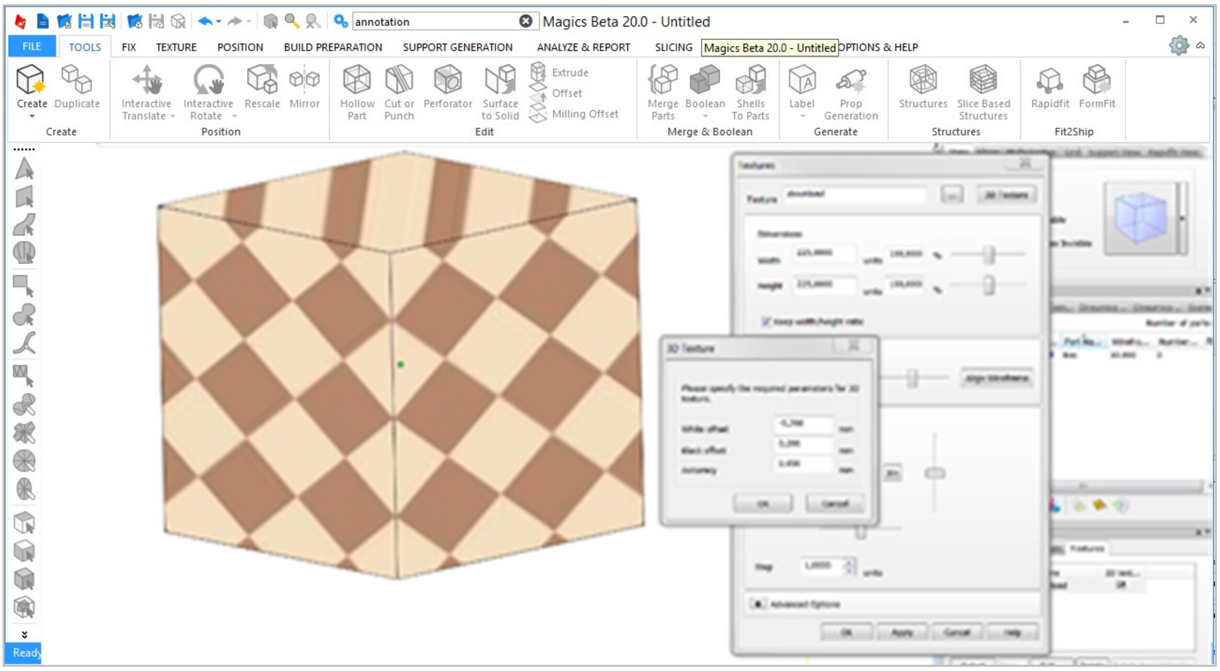
## 3.3 Automatic Support Generation

Automatic support generation can be done in different steps. The parameters for the support generation are defined like all other machine parameters and they are stored machine by machine. If you want to change support generation parameters, go to File/Machine Library. The list of machines appears. Select a machine and click 'Edit Parameters' to open the Machine Properties window. You can find more information about the Machine Library (how to add machines) in the first section of the manual in the section describing the File Menu. (When the platform is already present in the Platform Scenes, you can change the machine properties by going to Platforms/Machine Properties.)

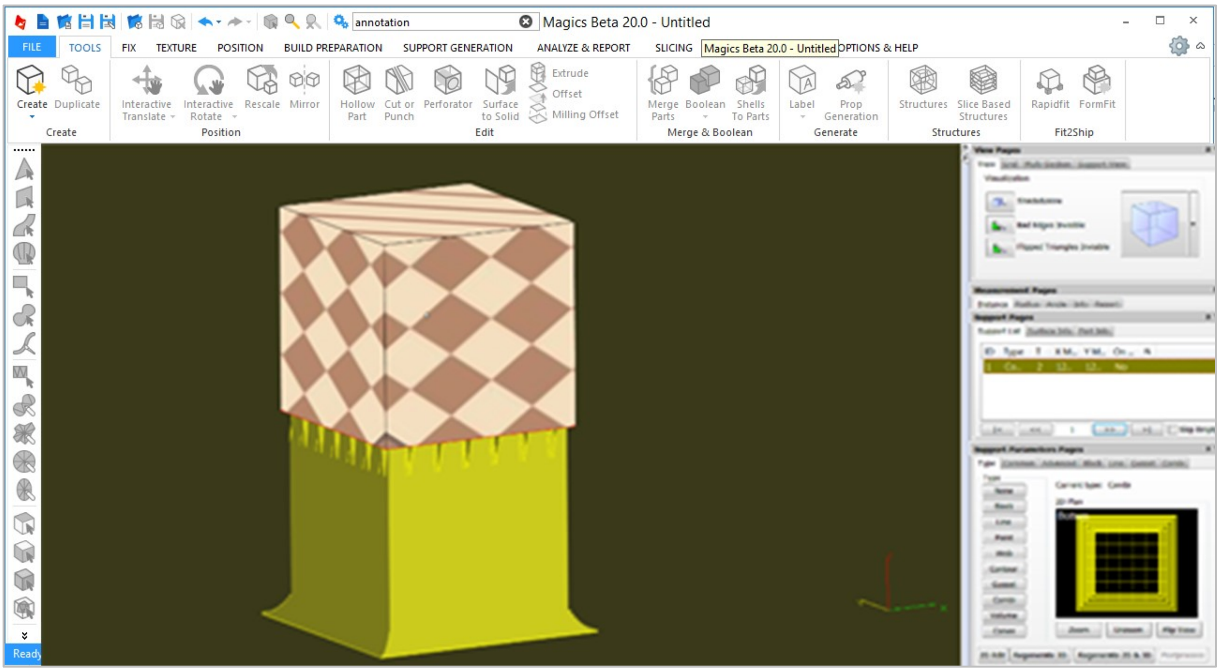



## 3.4 Support on 3D Texture and Slice Based Structures

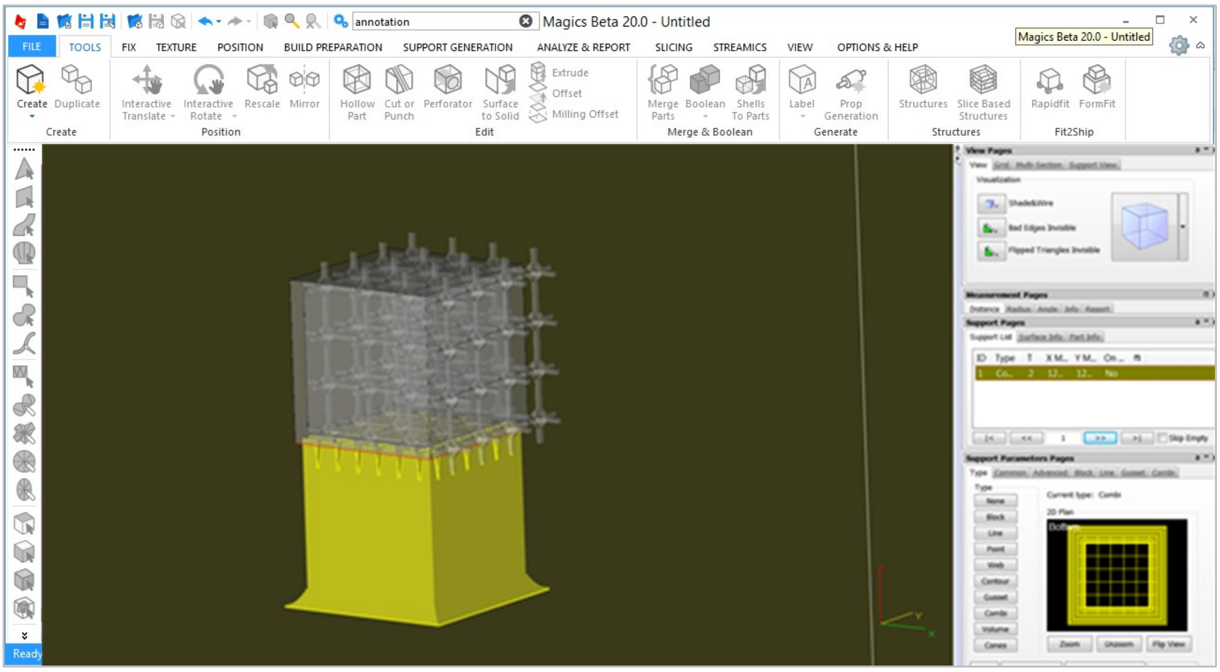
Thanks to our software solution, it's today possible to apply texture on your part in Magics which will be processed and considered as a 3D texture when processed by the build processor.



What you can see on Magics is than just a 2D preview on your part (for 3D texturing, see section above and BP). Support Generation module allows you to apply supports on a part where texture is applied.

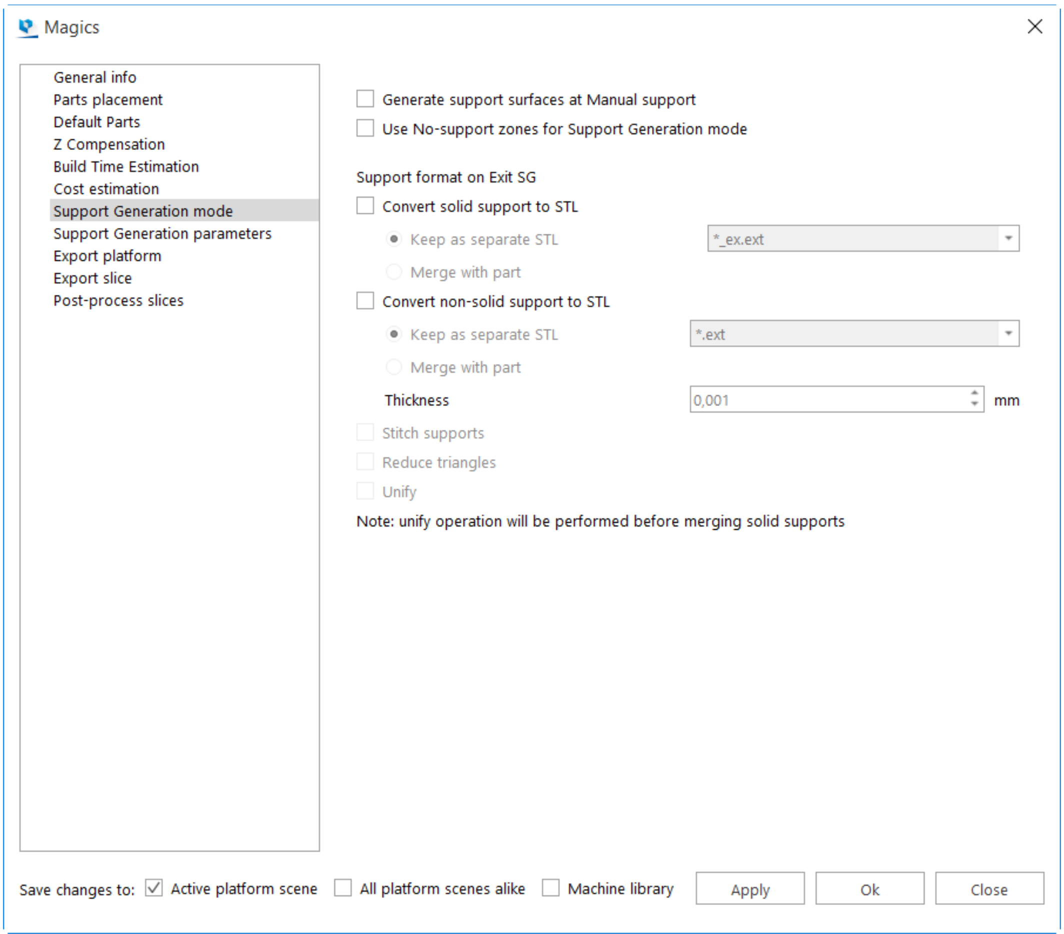


Carefully consider that 3d texture offset is not taken into account by support. The user might compensate the gaps using z-offset in supports. Also when a slice based structure is generated SG allows to generate support on the part. This can help in order to obtain a complete preview part-support-structure before sending everything to the machine via BP.



All the SG module parameters are editable and applicable.

## 3.5 Support Generation Mode

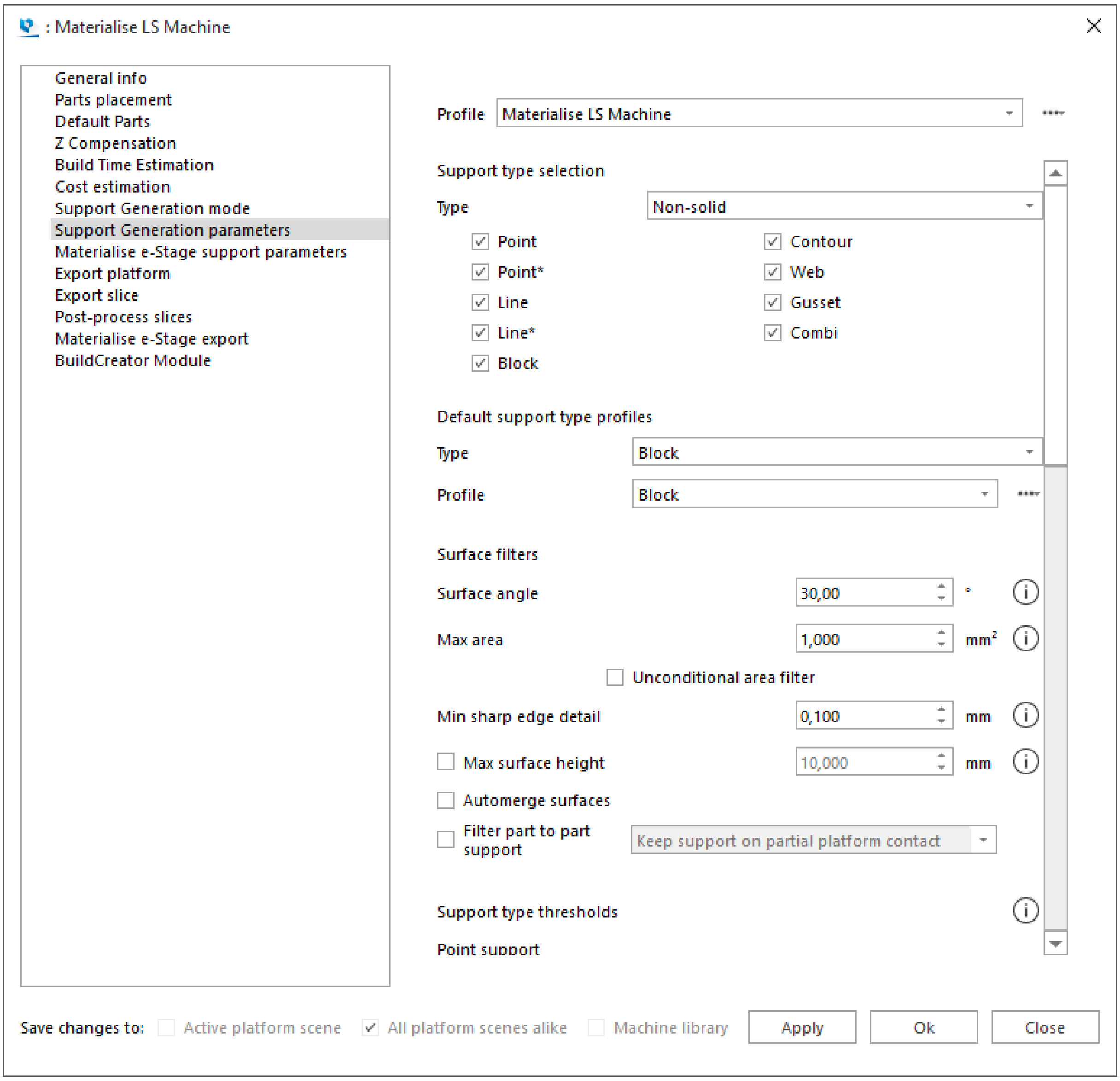


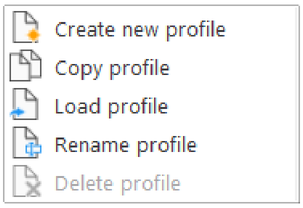

Generate support surfaces at Manual support is a useful feature for those who want to mark specific areas for support and do not want to wait too long for auto-generating of support surfaces which are not needed. Disable “Generate support surfaces at Manual support” to not calculate and generate these support surfaces in your support list.

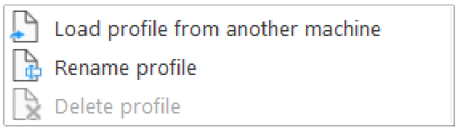
If Use No-support zones for Support Generation mode is checked, No-support zones will be taken into account when generating the support surfaces.

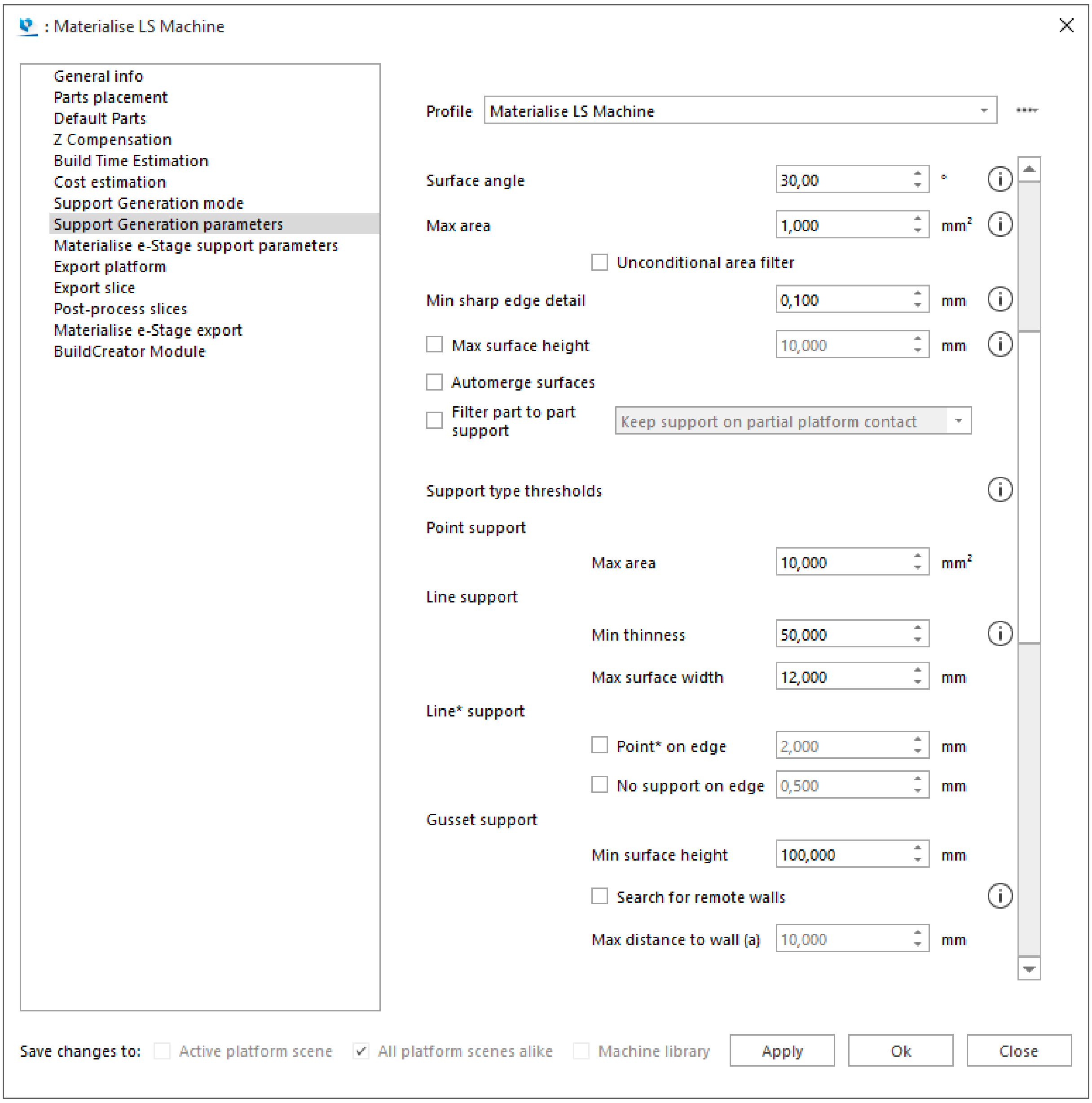
Supports can be converted to STL on Exit SG. You can choose to create a separate STL with a specific naming convention or you can merge the STL with the STL of the part. There is the option to use various fixing operations.

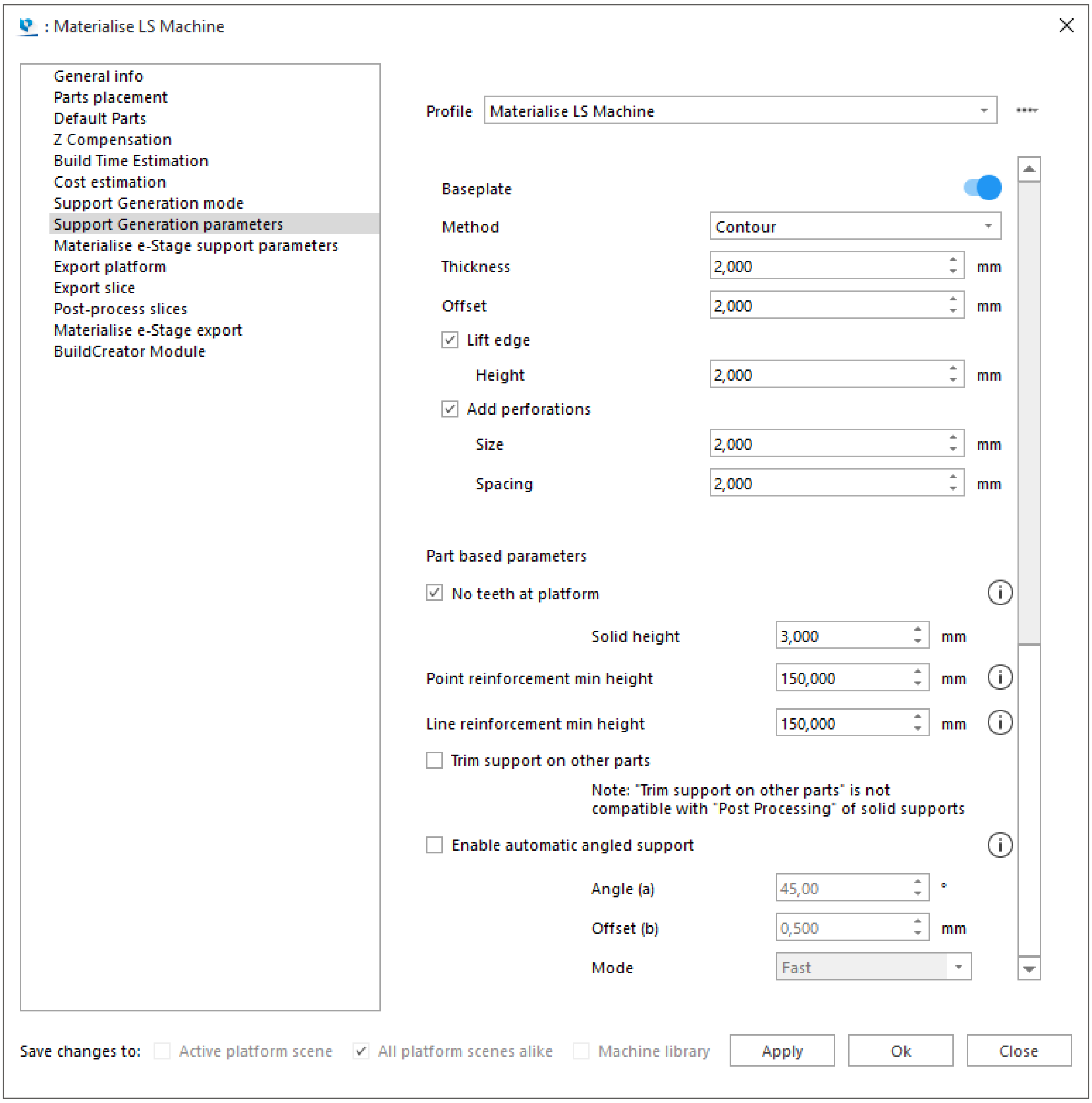
## 3.6 Support generation parameters




: Materialise LS Machine
General info
Parts placement
Default Parts
Z Compensation
Build Time Estimation
Cost estimation
Support Generation mode
Support Generation parameters
Materialise e-Stage support parameters
Export platform
Export slice
Post-process slices
Materialise e-Stage export
BuildCreator Module
Profile Materialise LS Machine
Surface angle 30,00 °
Max area 1,000 mm²
Unconditional area filter
Min sharp edge detail 0,100 mm
Max surface height 10,000 mm
Automerge surfaces
Filter part to part support
Keep support on partial platform contact
Support type thresholds
Point support
Max area 10,000 mm²
Line support
Min thinness 50,000
Max surface width 12,000 mm
Line* support
Point* on edge 2,000 mm
No support on edge 0,500 mm
Gusset support
Min surface height 100,000 mm
Search for remote walls
Max distance to wall (a) 10,000 mm
Save changes to: Active platform scene All platform scenes alike Machine library Apply Ok Close

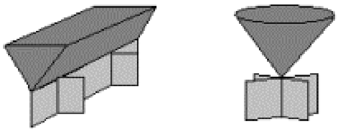



| | | |
|---|---|---|
| Profile | Magics offers the possibility to manage different support parameters profiles for the same machine. This represents something useful when working with different kind of parts, different materials or different part size which might request different supports and parameters. | |
| | Create new profile | Create a new support profile for the selected machine. |
| | Copy profile | Use an existing profile to create a new profile by copying. After copying the profile you can make the needed modifications. Make sure to save your modifications to the 'Machine library'. |

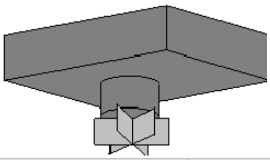
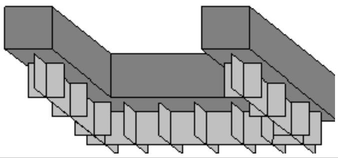
<table>
<tr><td rowspan="4"></td><td></td><td colspan="2">(Select 'Machine library in the left down corner)</td></tr>
<tr><td>Load profile</td><td colspan="2">Load an already existing profile into your instance of Magics. Profiles generated on other systems can also be loaded.</td></tr>
<tr><td>Rename profile</td><td colspan="2">Add a new name for the profile</td></tr>
<tr><td>Delete profile</td><td colspan="2">Remove a profile from the list when it is no longer used</td></tr>
<tr><td>Support type selection</td><td colspan="3">The user can define which types of support are generated automatically.</td></tr>
<tr><td rowspan="6">Default support type profiles</td><td colspan="3">For every support type, you can define a default support type profile. These profiles can be created in Support Generation Mode.</td></tr>
<tr><td>Type</td><td colspan="2">Select the type for which you want to choose the default.</td></tr>
<tr><td rowspan="4">Profile</td><td colspan="2">The support type profiles in this dropdown, will be available in Support Generation Mode. The selected profile will be the default profile that is used.</td></tr>
<tr><td>Load profile from another machine</td><td>It is possible to load support type profiles that were created for another machine.</td></tr>
<tr><td>Rename profile</td><td>Add a new name for the profile.</td></tr>
<tr><td>Delete profile</td><td>Remove a profile from the list when it is no longer used.</td></tr>
</table>

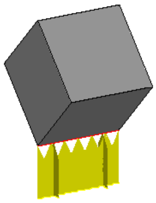
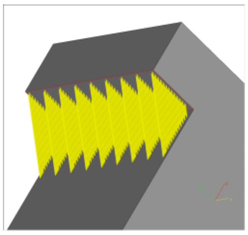
— Surface filters section

| | |
|---|---|
| Surface angle | The Surface Angle defines which triangles are selected for support generation and which are not. It is defined as the angle between the horizontal plane and the surface. Surfaces whose angle to the horizontal plane is bigger than the selection angle are supposed to be self-supporting. This angle can be changed individually for each supported surface in the Support Generation Module (see Modifying Surfaces, Support, Types and Parameters). |
| Surface filter | Noise in the STL file can give rise to a huge amount of surfaces. The Surface Filter will filter out all surfaces which are smaller than this parameter, and which are supported by at least one other triangle. These surfaces will not be visible in the interactive support generator. |
| Unconditional surface filter | The unconditional surface filter will filter out all surfaces smaller than this parameter, also those that are not supported by other triangles. |

| | |
|---|---|
| Sharp edge filter | Magics will support sharp down facing edges or points in the STL-file, in cases where there is no complete down facing surface available like for example in the following figures:  The surface area of a sharp edge support is 0. Consequently these sharp edges will be found at the end of the surface list in the Support Generation Module. This functionality is very sensitive to STL noise. STL noise can create a lot of situations in which sharp edge supports are placed. The Sharp Edge Filter will minimize the effect of STL noise and avoid unnecessary supports. The value of the Sharp Edge Filter determines the height of the details for which sharp edge supports will be generated. If this value is 0, all sharp edges will be supported. Typically you can set this parameter at the same value as the slice distance.  |
| Maximum height | Surfaces higher than the maximum height will not be supported. |
| Automerge surfaces | Surfaces with small sharp triangles can be automerged. |

— Support type thresholds section

<table>
<tr><td rowspan="2">Point support</td><td colspan="2">A Point Support will typically be selected for very small surfaces, where a Block Support would be too small and unstable.<br></td></tr>
<tr><td>Max area</td><td>A Point Support will be selected if the surface is smaller than the 'Max Area' defined on this page.</td></tr>
<tr><td>Line support</td><td colspan="2">A line support is used for narrow down facing areas. This support type consists of a single wall down the center of the area and a number of crossing walls. A line support is not as strong, but easier to remove than classical block support. Since high line supports can become unstable, the user can reinforce them with an additional contour wall.<br></td></tr>
</table>

| | | |
|---|---|---|
| | Min thinness | The thinness of the surface area must at least be equal to this value. The thinness indicates how narrow the shape of the surface is. It is calculated as the ratio of the square contour length and the area of the surface. With this parameter the user can influence the number of automatically generated line supports. |
| | Max surface width | In order to receive a line support automatically, the average width of the surface area may not exceed this value. |
| Line* support | Line* supports are a special kind of line supports. They support down facing edges. They do not support a surface (the surface is 0 mm² and contains 0 triangles).  | |
| | Point threshold | When the edge is shorter than the given length, a point support will be set. |
| | No support threshold | This filter will not put supports when the edge is shorter than the given length. |
| Gusset support | Gussets will support on a sidewall, rather than on the platform or on a surface below.  | |
| | Minimum surface height | Gussets are only interesting for surfaces that are positioned rather high (save resin). The surface must be higher than the Minimum Surface Height in order to receive a Gusset Support automatically. |
| | Maximum distance to wall | This parameter determines how far the supporting wall can be from the supported surface. |

— Baseplate

When enabled, a baseplate will automatically be generated for each part on the platform. This plate will also be printed and will be considered as support. It is often used in DLP printing, so parts can easily be removed from the platform, but it can also be useful in other technologies, like metal.

| | | |
|---|---|---|
| Switch | Toggles the baseplate on or off | |
| Method | Contour | The baseplate that is generated will roughly follow the contour of the parts. |
| | Bounding Box | The baseplate that is generated will be rectangular, according to the bounding box of the parts. |
| Thickness | The thickness of the generated baseplate. | |
| Offset | The offset that will be given to the baseplate, from the edge of the parts. | |
| Lift edge | When enabled, the edge of the baseplate will be lifted up. This can make it easier to remove from the platform. | |
| Height | The height with which the edge is lifted. | |
| Add perforations | When enabled, the baseplate will be perforated. This can be used to consume less material. | |
| Size | The size of the edge of the (square) perforations. | |
| Spacing | The space between the perforations, as measured from the edge of one perforation to the edge of the next perforation. | |

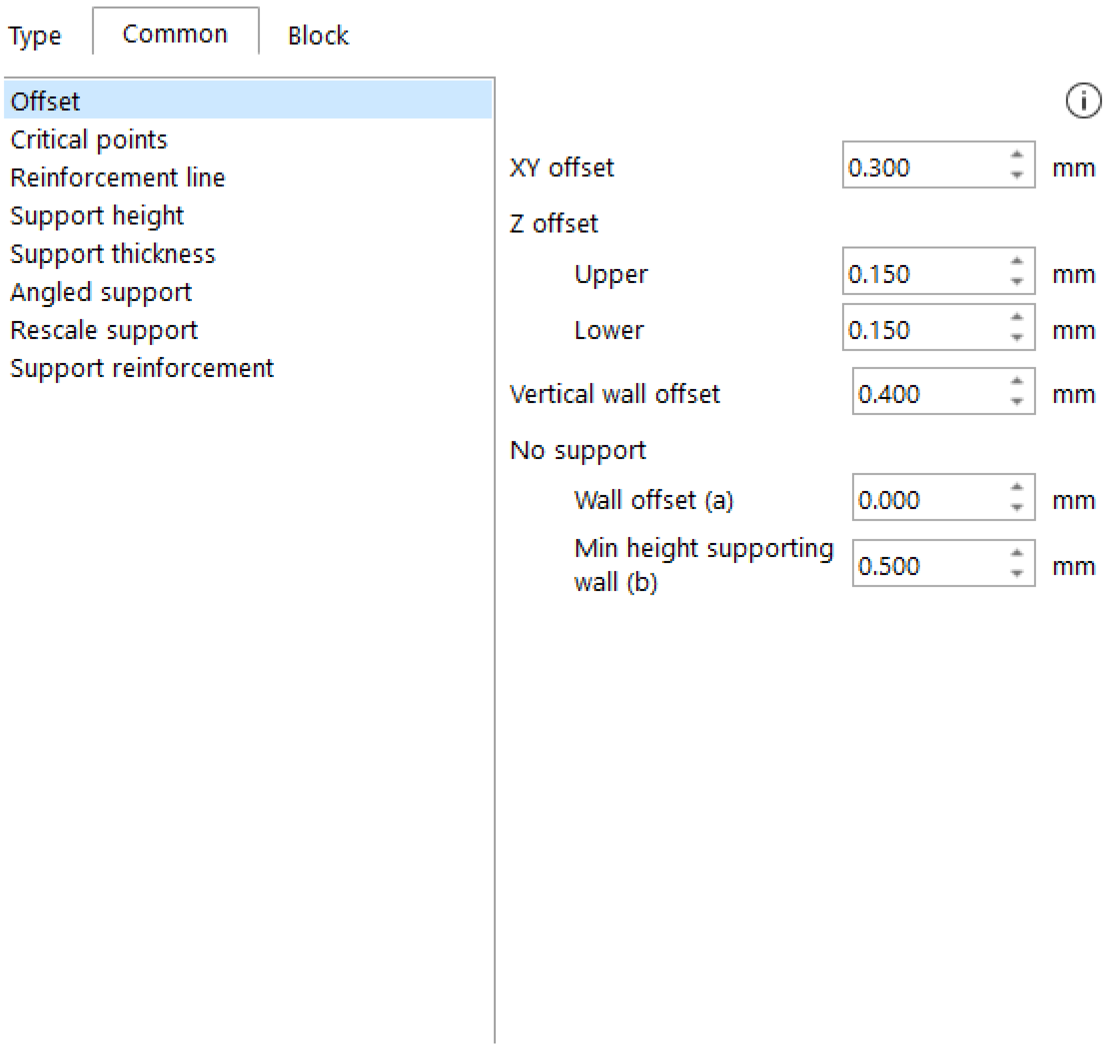
— Part based parameters section

| | | |
|---|---|---|
| No teeth at platform | Create teeth at platform at the bottom of a support when this is touching the platform, for easy support removal. | |
| | Solid height | When no teeth are generated, the solid height parameter determines a non-perforated support zone when perforations are applied to the support. |
| Point reinforcement min height | Point support reinforcement creates a box around the support; when a point support height is smaller than the defined value, the reinforcement will not be generated. | |
| Line reinforcement min height | Line support reinforcement creates a box around the support; when a line support height is smaller than the defined value, the reinforcement will not be generated. | |
| Trim supports on other parts | Supports will be trimmed with all other parts on the platform. It is advised to only turn this on if needed because it will slow down the generation of the supports. | |

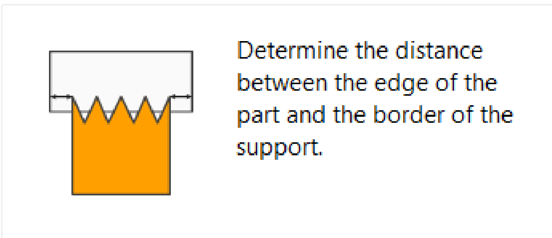
# 3.7 Support Parameters

## 3.7.1 Common

### *3.7.1.1 Offset*

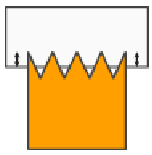



#### 3.7.1.1.1 XY offset



| | |
|---|---|
| XY offset | This offset defines how far the support must be from the border of the part. |

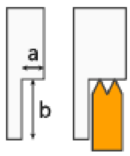
#### 3.7.1.1.2 Z offsets



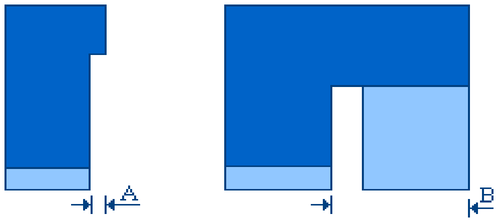
Determine the distance between the top and/or the bottom of the support and their respective surfaces.
Positive values ensure the support penetrates the part. This is recommended to properly connect the support to the part.

| | | |
|---|---|---|
| Z offsets | All the supports can have a certain offset into the part in order to ensure a better contact between part and support. | |
| | Upper Z Offset | You can specify an offset in the supported surface. |
| | Lower Z Offset | You can specify an offset in the supporting surface. |

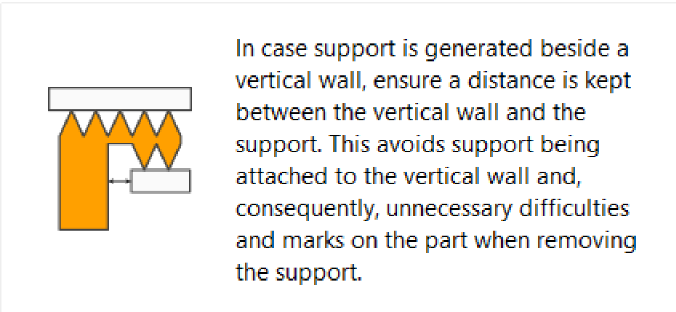
#### 3.7.1.1.3 No support offset

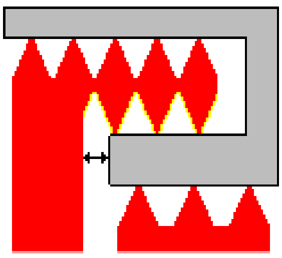



A (more or less) vertical wall gives support to another surface; in this case, no support needs to be generated for very small overhangs.
Define the distance up till a overhang is self-supporting and the minimum height for a wall to be considered a supporting wall.

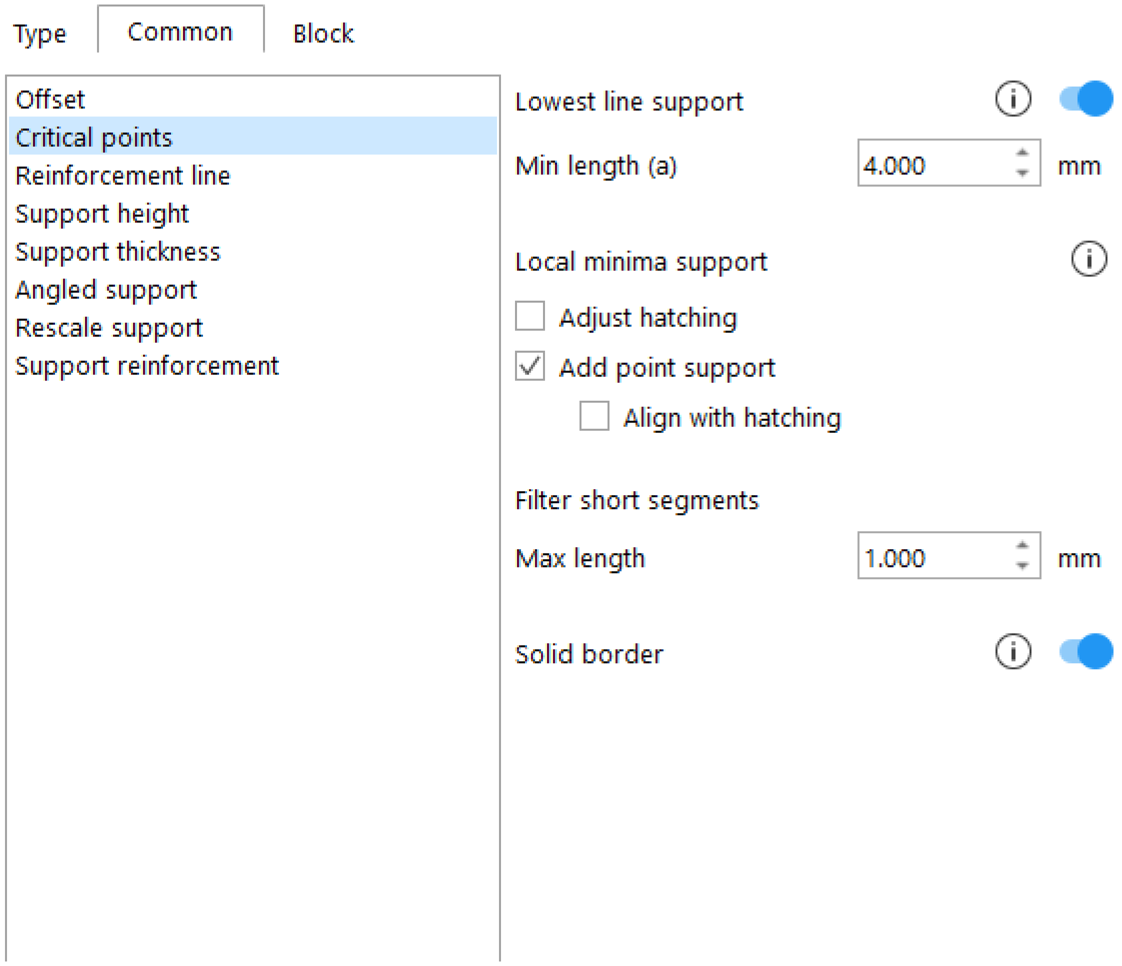
<table>
<tr><td rowspan="3">No support offset</td><td colspan="2">A (more or less) vertical wall gives support to another surface. For this reason, there is no support needed if there is only a very small overhang.<br><br></td></tr>
<tr><td>No Support Offset</td><td>You can define the distance up till where the vertical wall is supporting.</td></tr>
<tr><td>Minimum Height Supporting Wall</td><td>You can define the minimum height of the wall to be a supporting wall.</td></tr>
</table>

### 3.7.1.1.4 Vertical wall offset

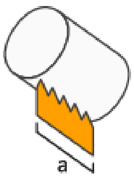



<table>
<tr><td>Vertical wall offset</td><td>In case a support is generated beside a vertical wall, the parameter Vertical Wall Offset makes sure a distance is kept between the vertical wall and the support. This avoids support being attached to the vertical wall and hence, unnecessary difficulties and marks on the part when removing the support.<br></td></tr>
</table>

### 3.7.1.2 *Critical points*



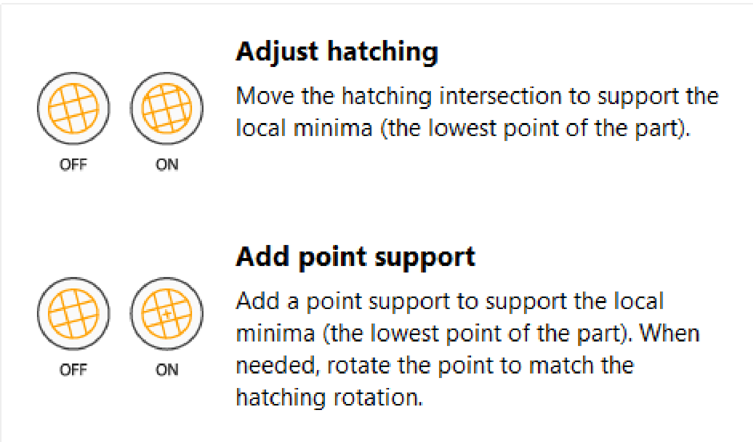

#### 3.7.1.2.1 Lowest line




Automatically generate an extra line of support to ensure the lowest line (the imaginary line connecting the lowest points of the surface) is supported.

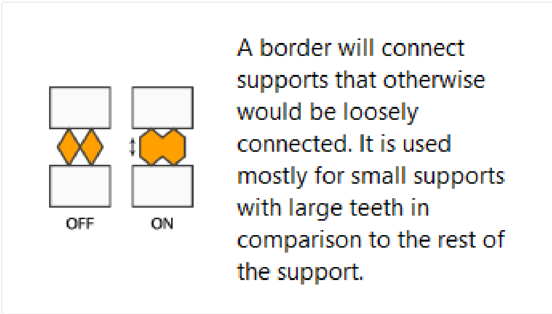
| | | |
|---|---|---|
| Lowest Line | When placing a support under a curved surface, it can happen that the lowest line (= the imaginary line connecting the lowest points of the surface) is not supported correctly. This can cause problems when building the part with some RP-techniques. When lowest line is checked, an extra line of support will be placed so that this lowest line is correctly supported. Due to the surface triangulation it can be that some 'noise' lowest lines pop up. In that case you can better use the Local Minima. | |
| | Minimum Length | Lowest Lines smaller than this length will be filtered out. |

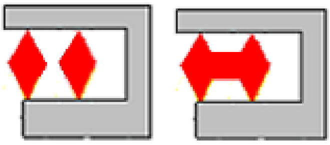
#### 3.7.1.2.2 Local Minima




| | | |
|---|---|---|
| Local Minima | It can happen that some local minima are not supported. This can cause problems when building the part with some RP – techniques. When Local Minima is checked, a support will be placed. Local Minima is most convenient when building organic parts. | |
| | Adjust Hatching | Will move the hatchings in X and/or Y so that the local minima are supported. |
| | Add Point Support | Will add a point support under the minima. You can choose to align this point support with the hatchings. |

#### 3.7.1.2.3 Solid border

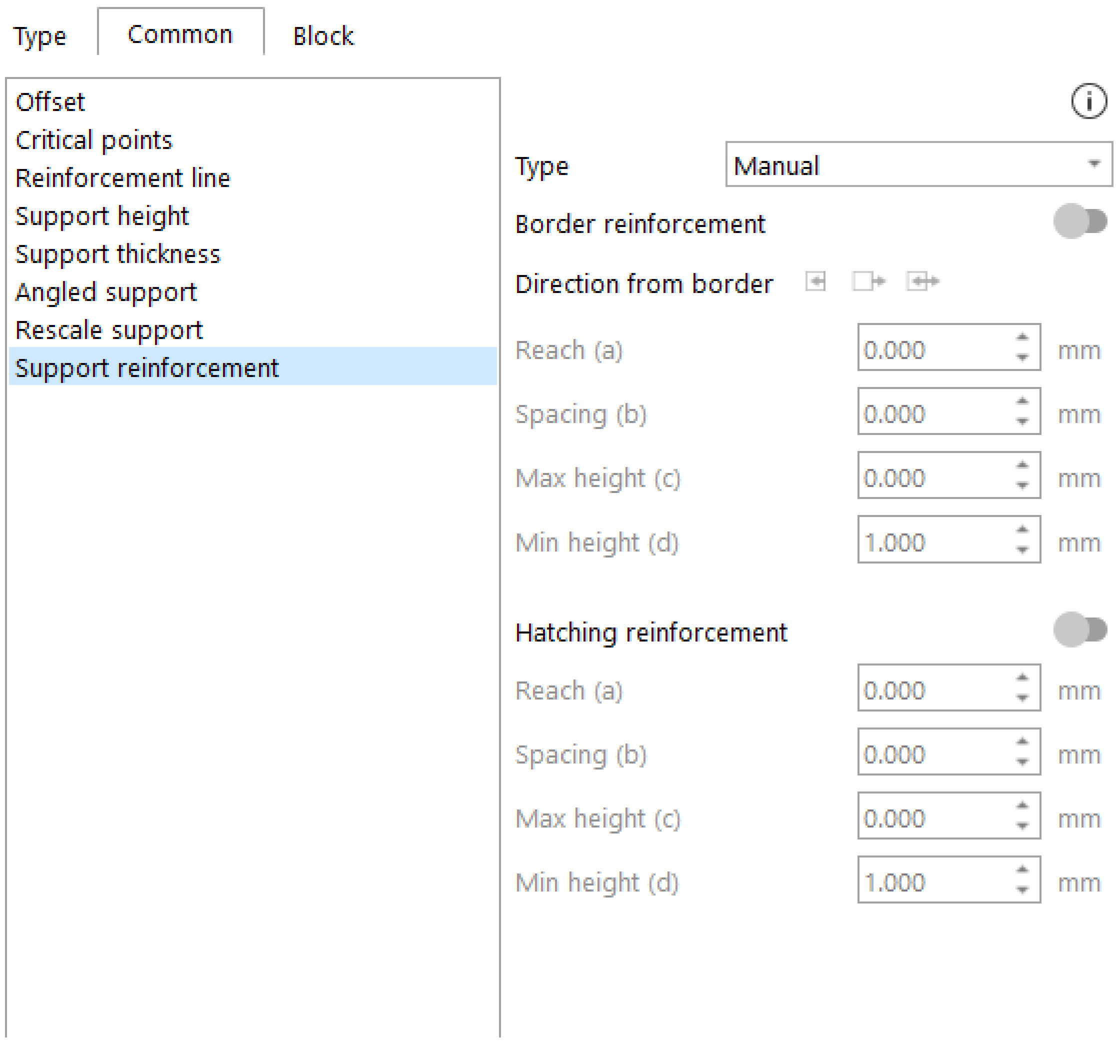


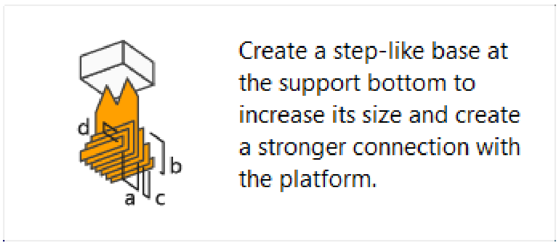

| | |
|---|---|
| Solid Border | When teeth in a trim support are isolated you can connect them with a solid border to give extra support.  |

### 3.7.1.2.4 Filter segments

| | |
|---|---|
| Filter Segments | A support with a length less than the given one will be filtered out. |

### 3.7.1.3 Support reinforcement

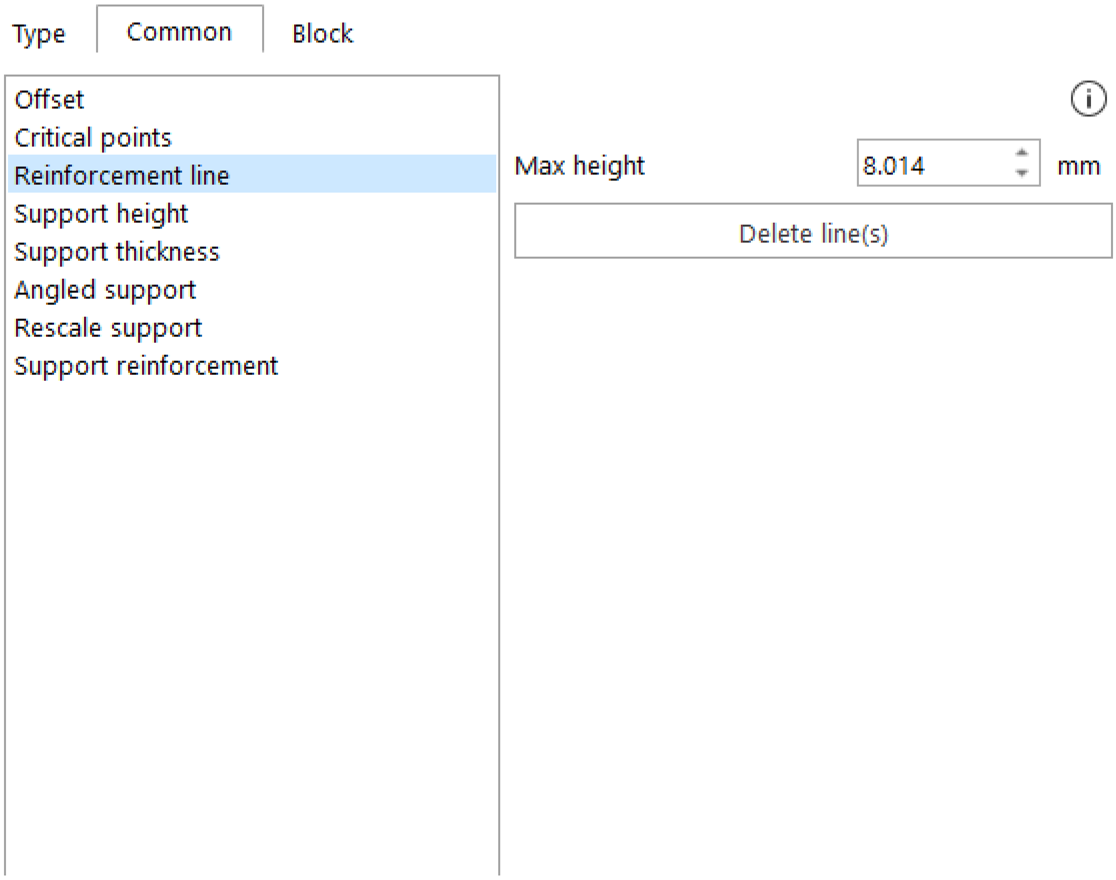


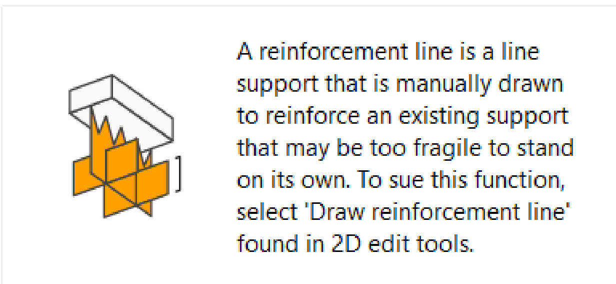




| | | |
|---|---|---|
| Broaden supports | Create a base with steps to make your supports bigger at the bottom of the platform, by adding line supports | |
| Manual | Broaden support manually by defining the parameters yourself | |
| | Inner | Create extra support starting from the outer border, reaching inwards |
| | Outer border | Create extra support starting from the outer border, reaching outwards |

| | | |
|---|---|---|
| | Internal | Create extra supports starting from the internal hatching, reaching both directions perpendicular to the hatching |
| | Reach | The distance between the existing support structure and the furthest newly created structure |
| | Height | The height of the biggest "step" |
| | Spacing | The space between each line support |
| | Minimum height | Set the minimum height of each line support |
| Automatic | Supports are automatically broadened during generation | |
| | Minimum length | All supports smaller than this minimum length will be broadened |
| | Reach | The distance that the broadened support will reach from the initial support |
| | Height | The maximal height of the additional support |
| | Spacing | The space between each new line support |
| | Minimum height | Set the minimum height of each line support |

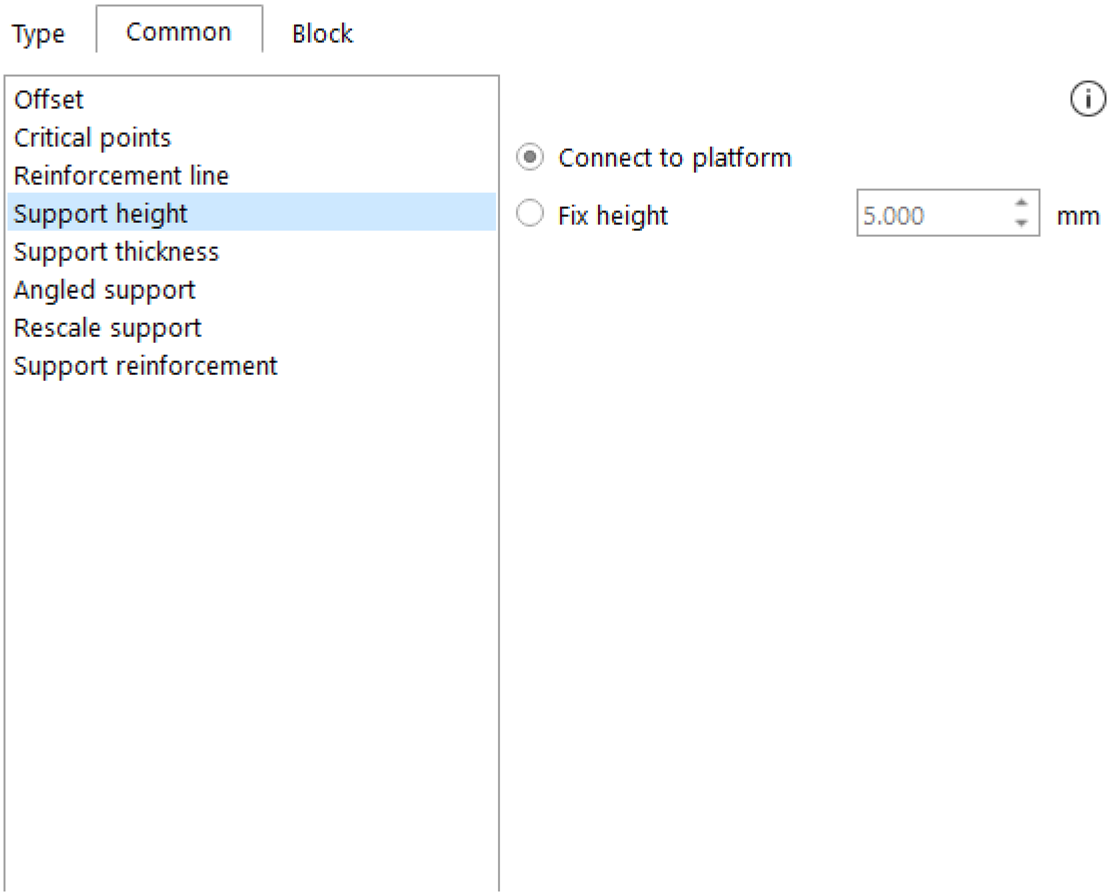
### 3.7.1.4 Reinforcement line

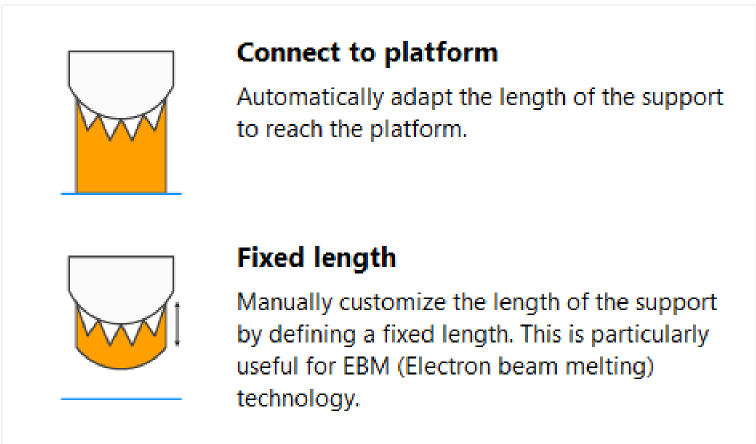



| | | |
|---|---|---|
| Reinforcement Line | A very tiny support can be reinforced in order to stabilize it. A reinforcement line is created between the tiny support and a larger nearby support. | |
| | Maximum Height | The Maximum height of the reinforcement line. |

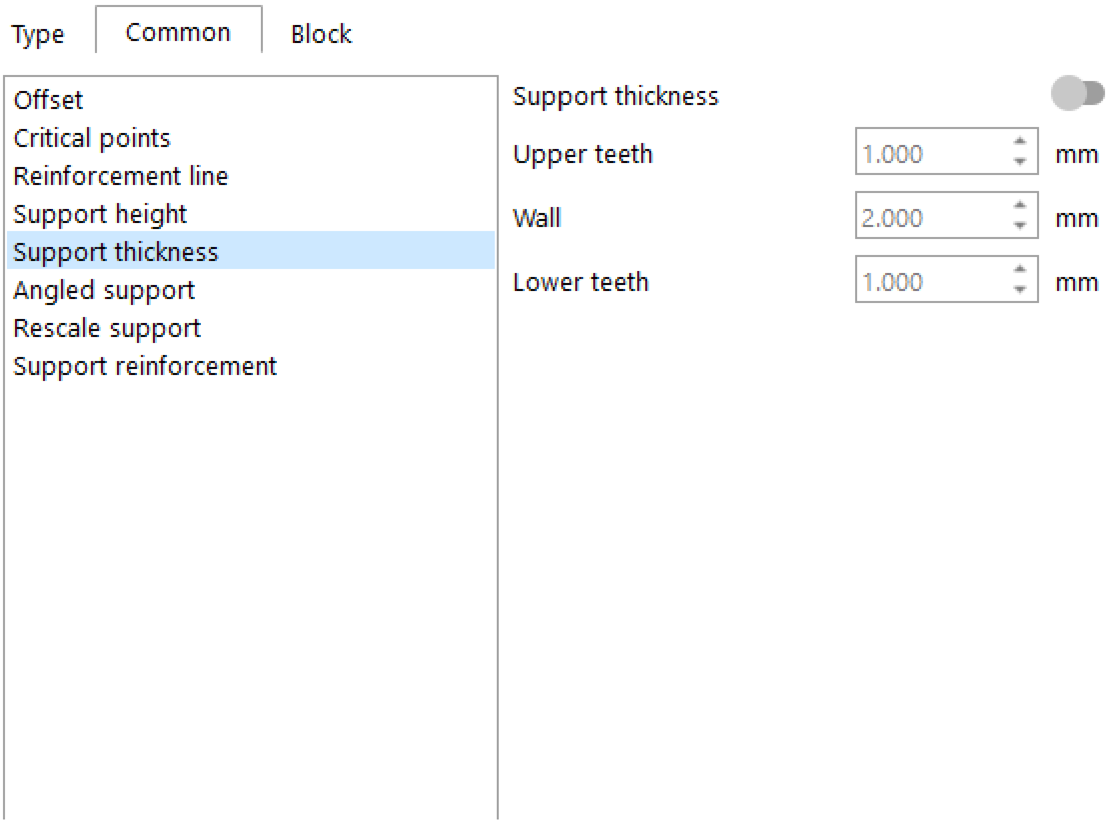
### 3.7.1.5 Support height



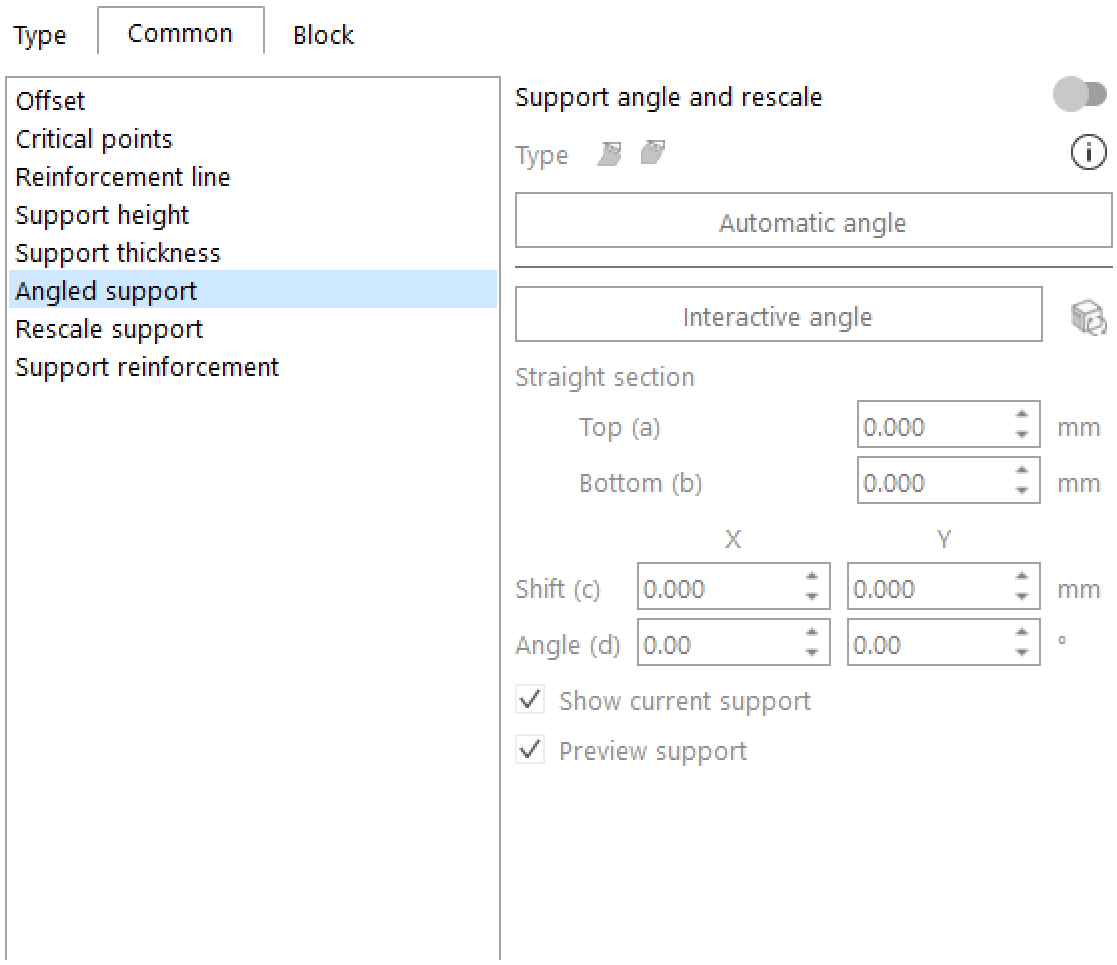

| | | |
|---|---|---|
| Support Length | Adapt the length of the support | |
| | Connect to platform | The length of the support reaches till the platform |
| | Fixed height | Customize the height of the support by defining a fixed height |

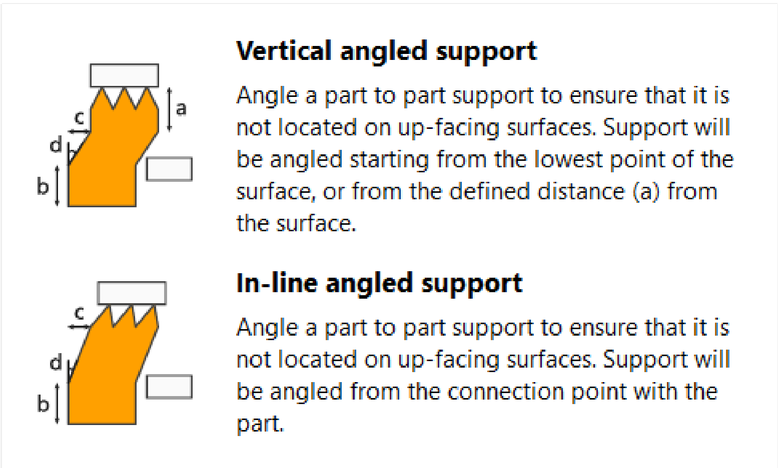
### *3.7.1.6 Support thickness*




| | | |
|---|---|---|
| Thickness | Set the thickness for non-solid supports. | |
| | Upper teeth (a) | The thickness of the upper teeth in mm. |
| | Wall (b) | The thickness of the wall in mm |
| | Lower teeth | The thickness of the lower teeth in mm |
| | Trim at surface | The trim Z offset in mm |

### 3.7.1.7 Angled support

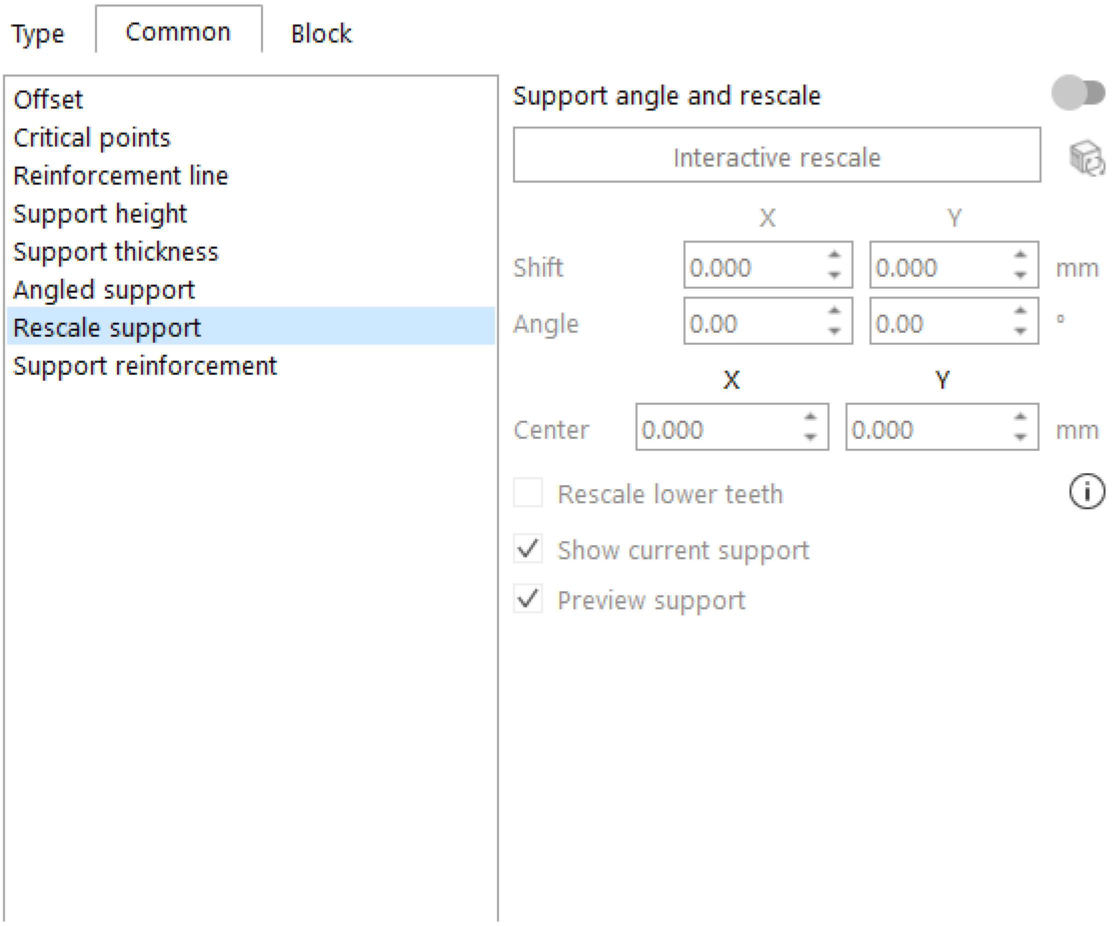


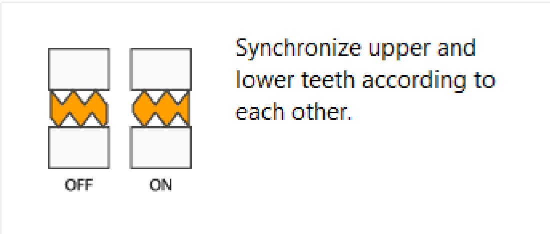




| | | |
|---|---|---|
| Angled support | Create supports under a certain angle to prevent that the supports are located on up – facing surfaces | |
| | Straight | Set the distance on top and bottom of the straight support |

| | | |
|---|---|---|
| | Shift | Indicate how far the support have to be moved so it is placed under the desired angle |

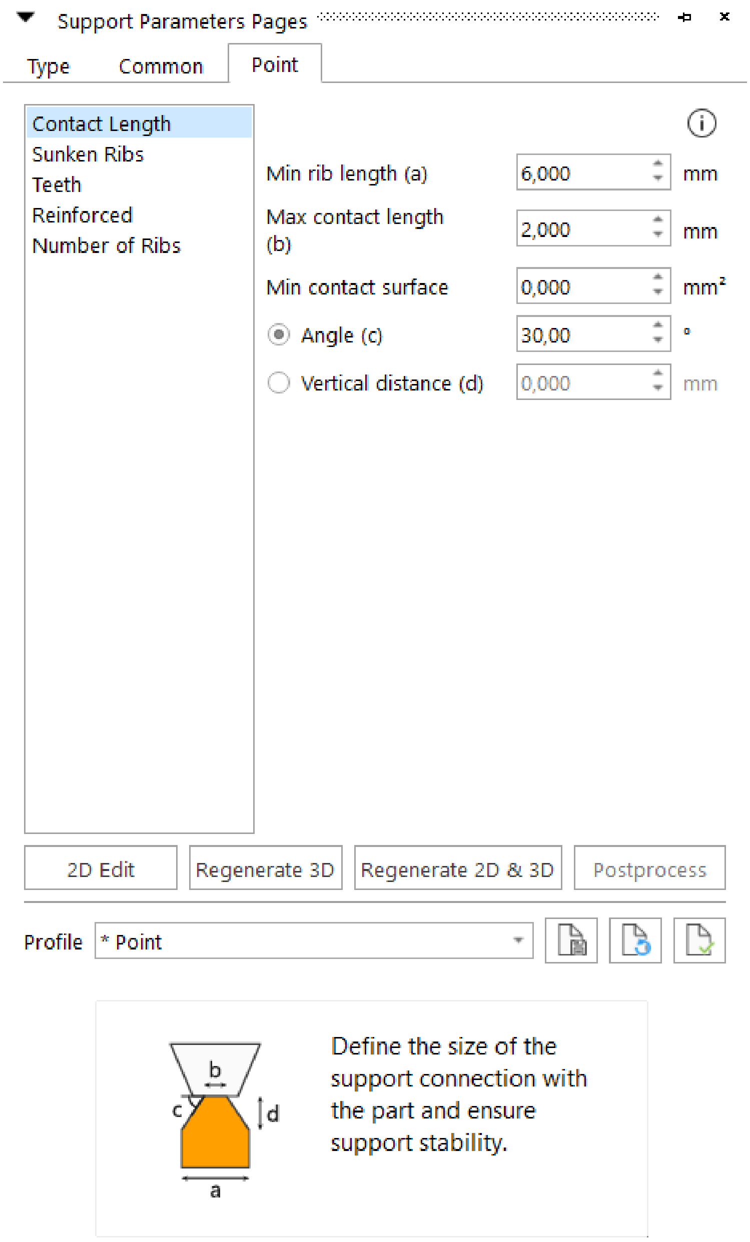
### 3.7.1.8 *Rescale support*



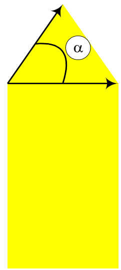
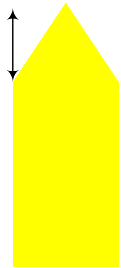

| | | |
|---|---|---|
| Rescale support | Define a new projection area to be used when generating angled support. | |
| | Shift | Indicate in XY how much bigger the projection area has to be |
| | Rescale lower teeth | Rescale support's lower teeth to synchronize the teeth number with the upper teeth.   |

## 3.7.2 Point

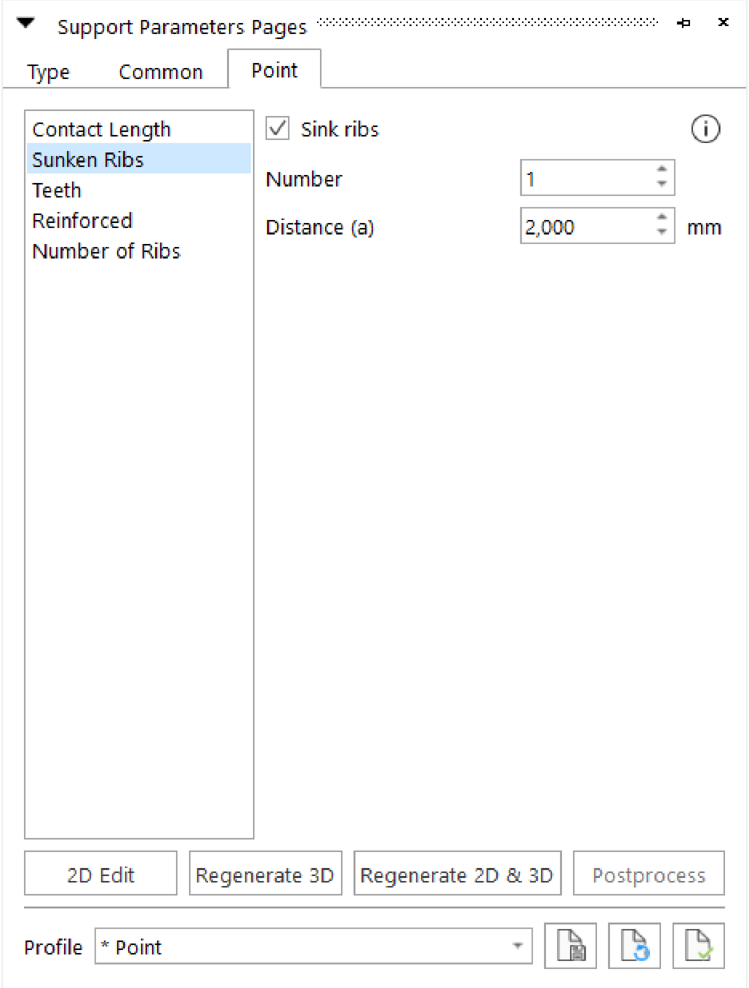
### *3.7.2.1 Contact length*

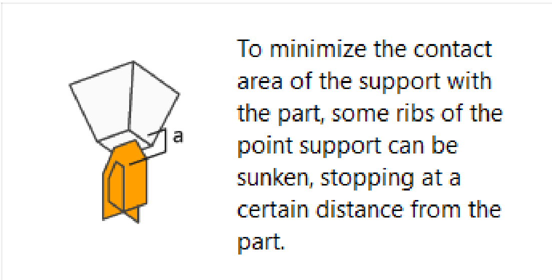



| | | |
|---|---|---|
| Contact length | Minimum Rib Length | Determines the length of the ribs. *Note:* you need a minimal length in order to have enough stability and to prevent the support from falling through the platform grid. |
| | Maximum Contact Length | You also can define whether to support the complete surface or only a certain Contact Length. |

| | | |
|---|---|---|
| | Angle | You can choose the angle $\alpha$, from the support to the part.   |
| | Vertical Distance | You can choose the distance from the support to the part.  |

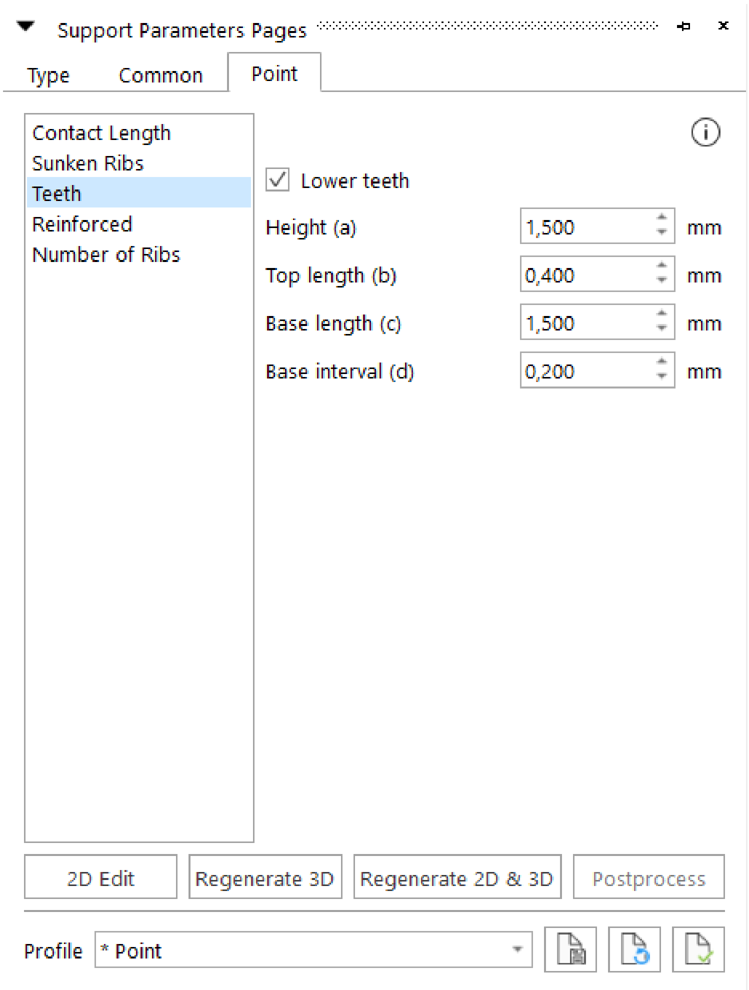
### 3.7.2.2 Sunken ribs

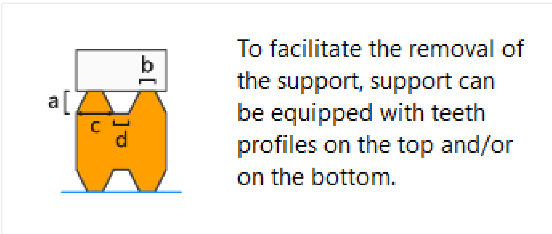


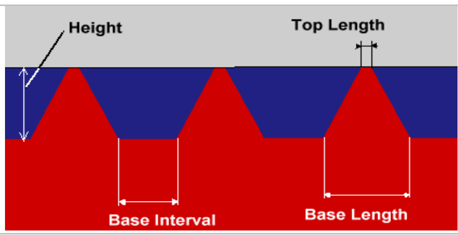

<table>
<tr><td rowspan="2">Sunken ribs</td><td colspan="2">To minimize the contact area of the support with the parts, some ribs of the point support can be sunken. This means that they will not go till the part. They will stop at a certain distance before the part.</td></tr>
<tr><td>Distance</td><td>The distance that a sunken rib will stop before the part.</td></tr>
</table>

### 3.7.2.3 Teeth

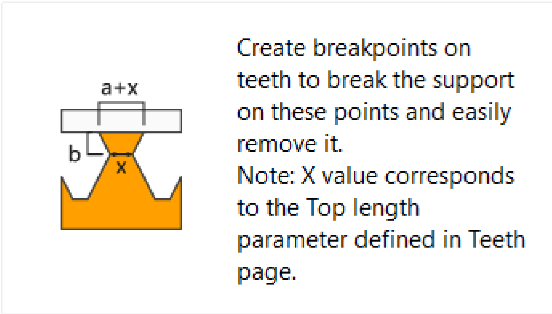



| | | |
|---|---|---|
| Teeth | In order to remove the supports easily from the part, the line supports are equipped with teeth profiles on the top and on the bottom. | |
| | Upper | You can specify whether you want Upper Teeth and/or Lower Teeth. Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Lower | |

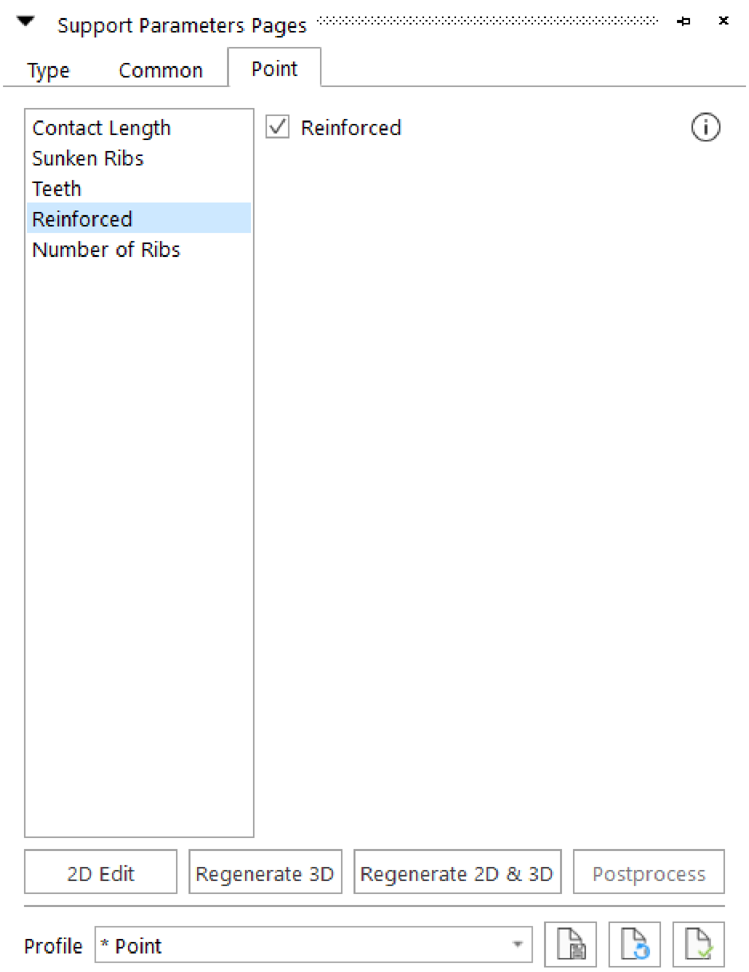
| | | |
|---|---|---|
| | Height |  |
| | Top Length | |
| | Base Length | |
| | Base Interval | |
| | Lower Teeth Same as Upper Teeth | The Lower Teeth have the same specifications as the Upper Teeth. |
| | Full teeth in ends | You can decide to half a full tooth at the end of a support, instead of half a tooth. |

### 3.7.2.4 *Teeth breakpoint*



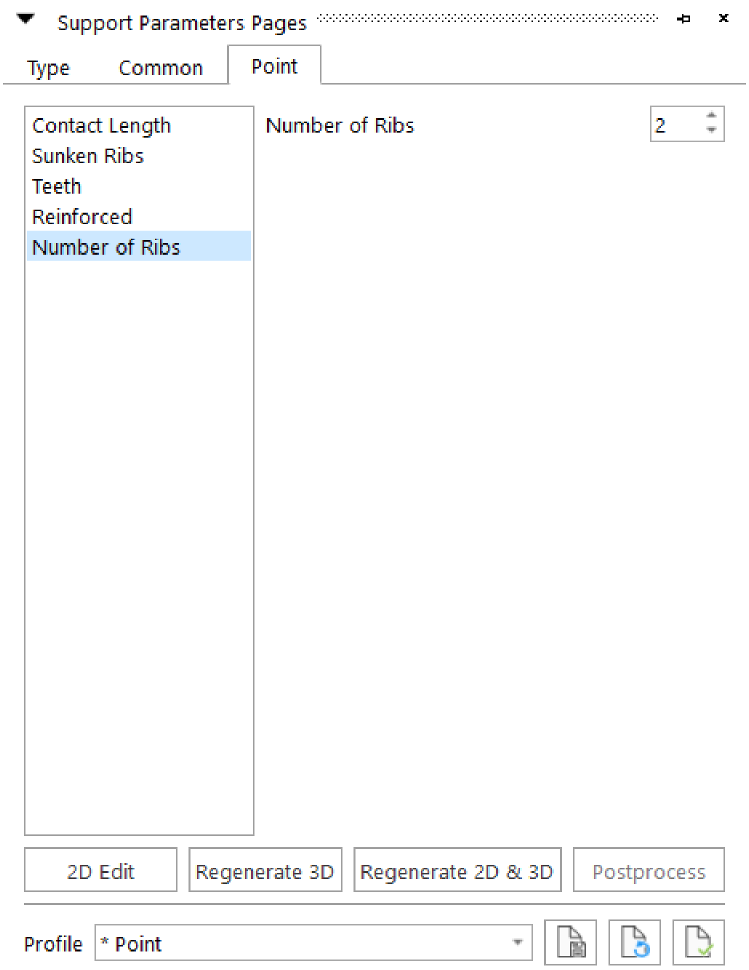

| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |

### *3.7.2.5 Reinforced*




| | |
|---|---|
| Reinforced | You can decide to reinforce a support by adding an extra contour by checking the Reinforced checkbox. |

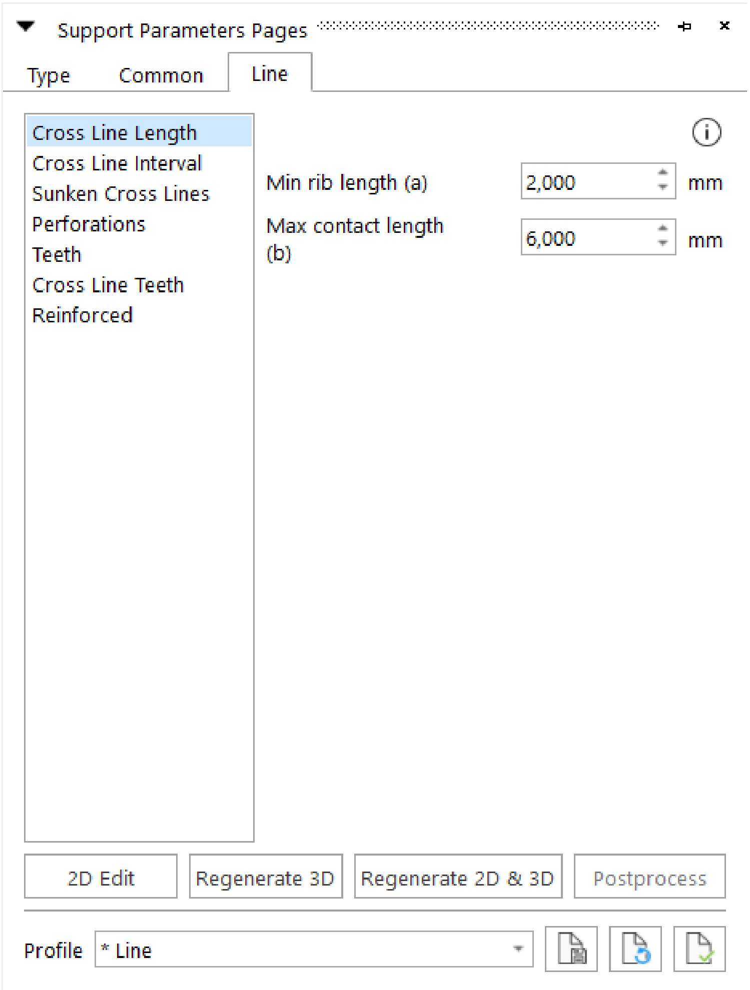
### *3.7.2.6 Number of ribs*

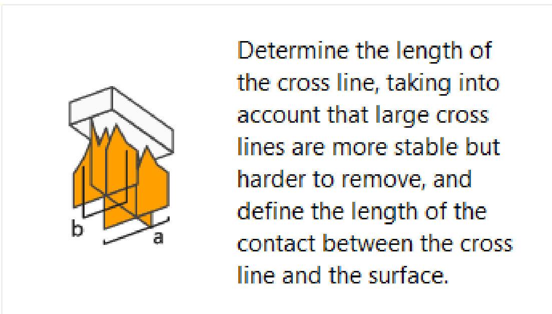



| | |
|---|---|
| Number of Ribs | Determine the number of the ribs. |

## 3.7.3 Line

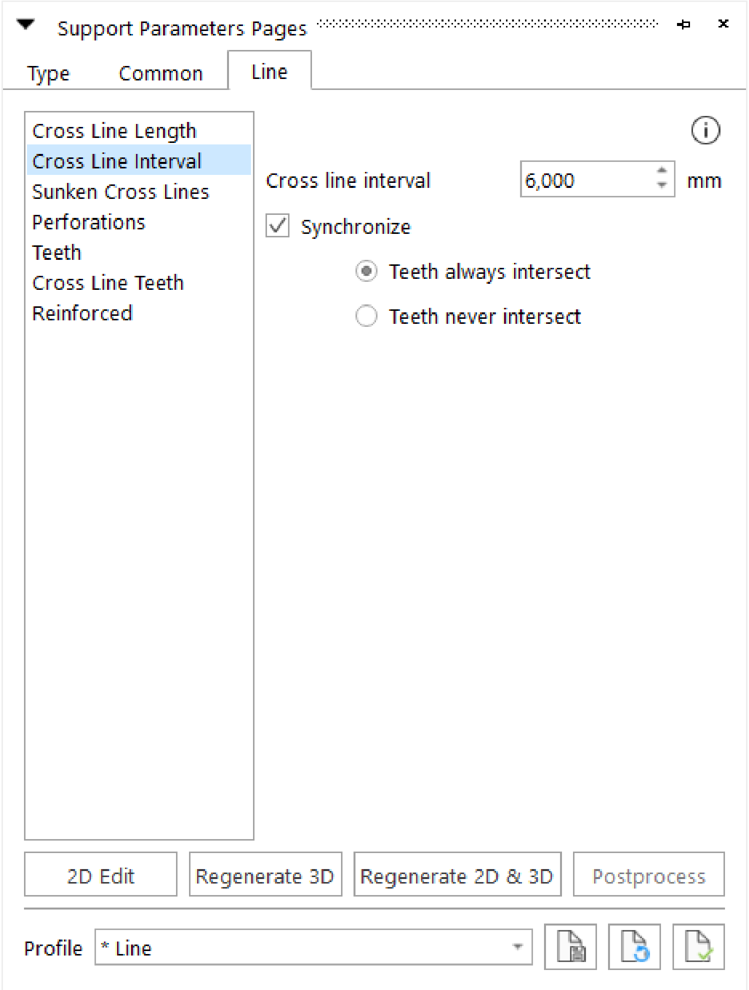
### *3.7.3.1 Cross line length*

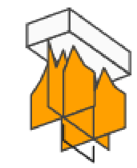



| | | |
|---|---|---|
| Cross line length | Here, you can enter the length of the crossing lines. | |
| | Minimum Rib Length | The length of the crossing lines. |
| | Maximum Contact Length | The contact length of the crossing lines with the support. |

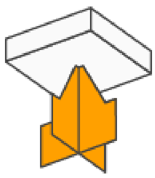
### *3.7.3.2 Cross line interval*



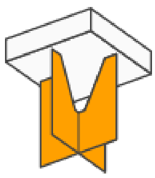
**Cross line interval**

Define the distance between two consecutive cross lines of a line support.



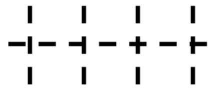
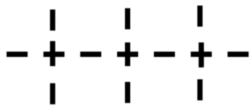
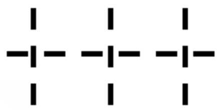
**Teeth always intersect**

Cross line teeth and central line teeth intersect each other right in the middle.

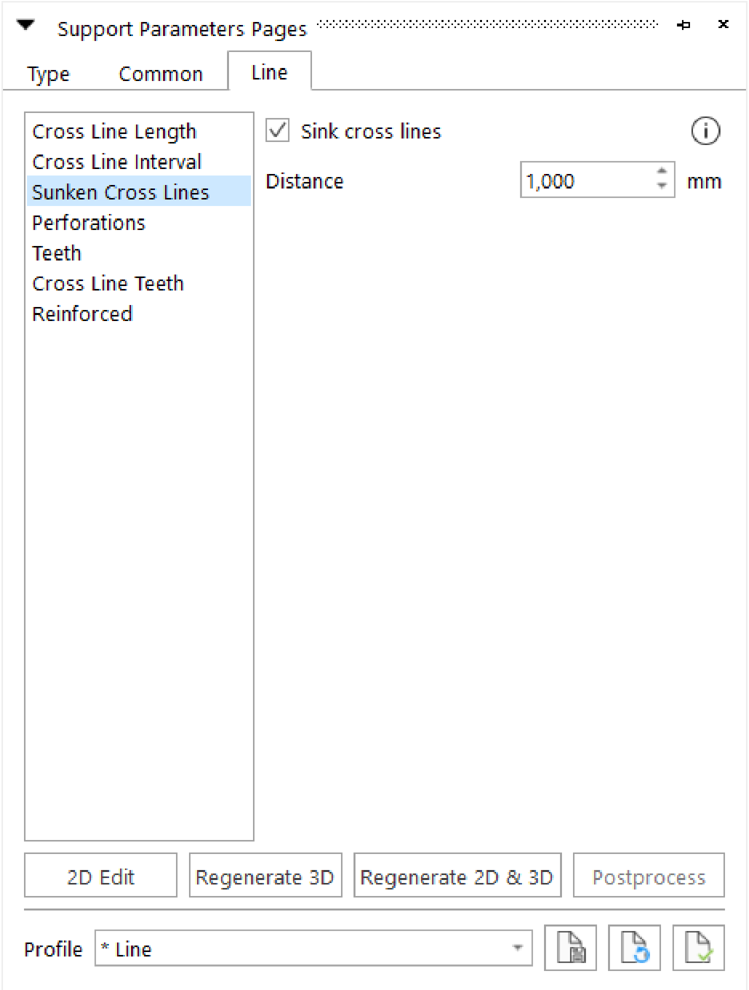


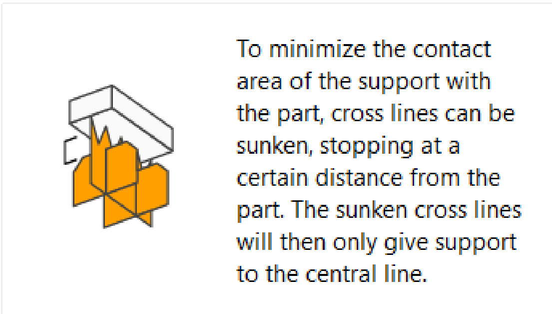
**Teeth never intersect**

Cross line teeth and central line teeth never intersect each other.

<table>
<tr><td rowspan="5">Cross line interval</td><td colspan="3">Here you can set the distance between two consecutive cross lines of a line support.</td></tr>
<tr><td rowspan="3">Synchronize</td><td colspan="2">The user can allow the synchronization of the teeth of the cross lines and the teeth of the central line.<br>An example of Line support without synchronization is shown below.<br></td></tr>
<tr><td>Teeth Always Intersect</td><td>The teeth of the cross lines and the central line cross each other right in the middle.<br></td></tr>
<tr><td>Teeth Never Intersect</td><td>The teeth of the cross lines avoid to cross the teeth of the central line.<br></td></tr>
<tr><td>Upper and lower teeth synchronizati on</td><td colspan="2">Upper and lower teeth will be synchronized</td></tr>
</table>

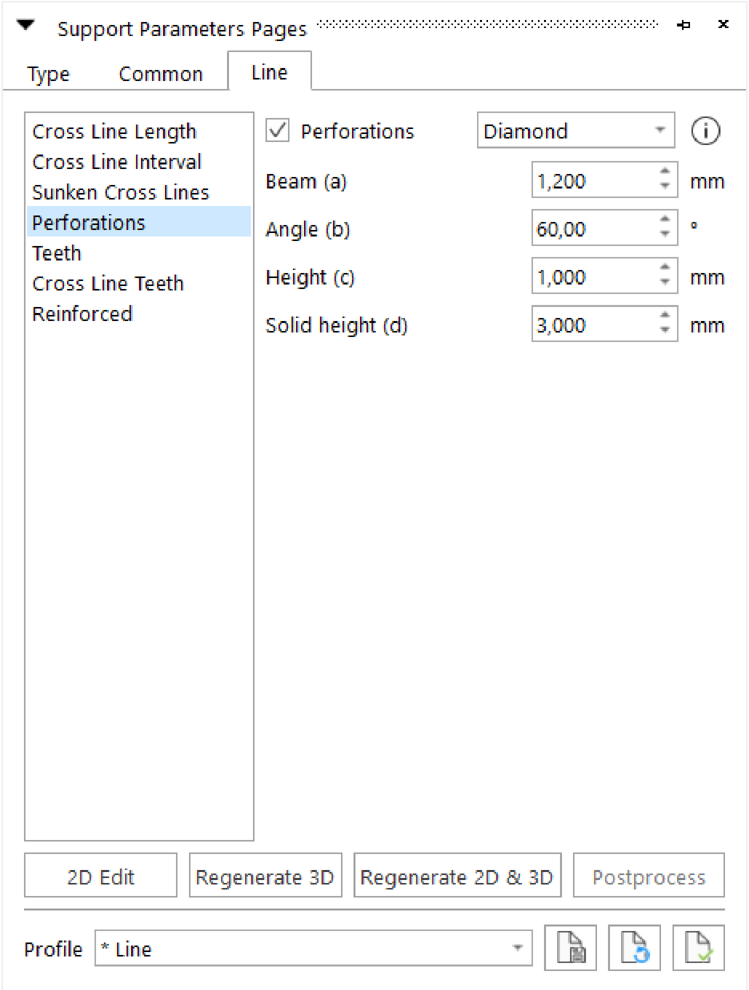
### 3.7.3.3 Sunken cross lines

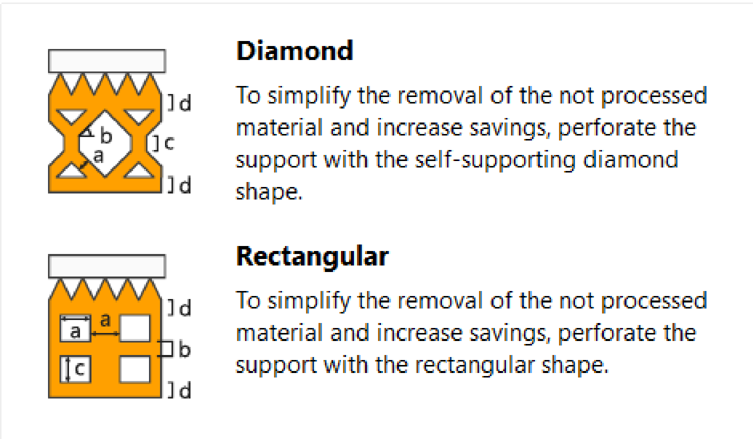


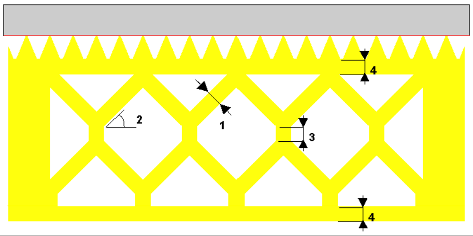
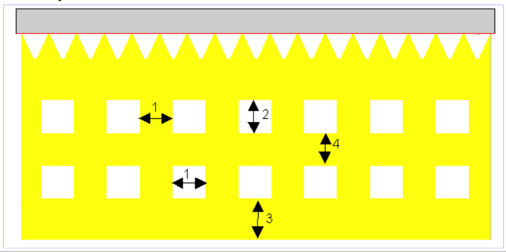

| | | |
|---|---|---|
| Sunken Cross Lines | To minimize the contact area of the support with the parts, the cross lines can be sunken, this means that they will not go till the part. They will stop at a certain distance before the part. | |
| | Distance | The distance that a sunken cross line will stop before the part. |

### *3.7.3.4 Perforations*



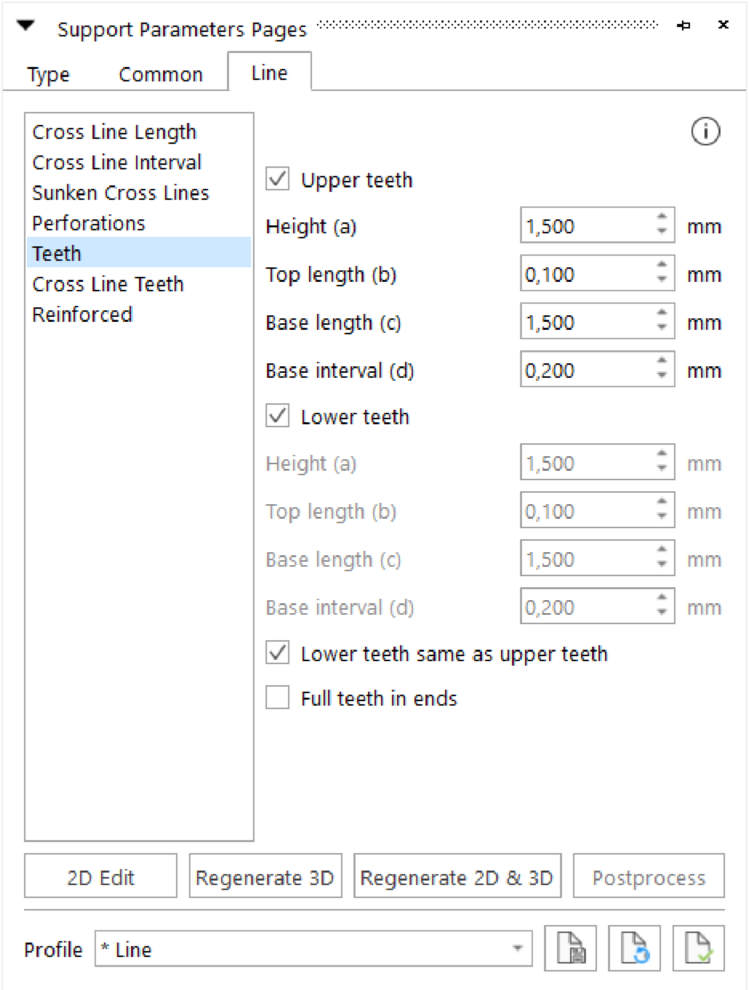



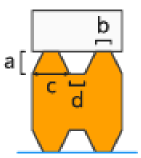

| | |
|---|---|
| Perforations | If this option is checked, the support will be perforated.<br>There are two kind of perforations possible: |

| | | | |
|---|---|---|---|
| | Diamond | The shape and the size of the perforations are user defined by setting four parameters:  | |
| | | Beam | The beam thickness (1) defines the thickness of the beams. |
| | | Angle | The perforation angle (2) determines the angle of the perforations |
| | | Height | The height (3) of the vertical part is set with this parameter. |
| | | Solid Height | The separate parameter Solid Height (4) guarantees a good connection to the platform and the teeth. |
| | Rectangular | The shape and the size of the perforations are user defined by setting four parameters:  | |
| | | Width | The width parameter (1) defines the width of the rectangular holes. |
| | | Height | The Height parameter (2) defines the height of the rectangular holes |
| | | Solid Height | The Solid Height (3) parameter guarantees a good connection to the platform and the part. |
| | | Interval | The interval parameter (4) defines the interval between the holes. |

| | | | |
|---|---|---|---|
| | | Only Perforate… rows | The support will only be perforated for the given rows, starting from the bottom. This enables the drainage of resin and ensures stable supports. |

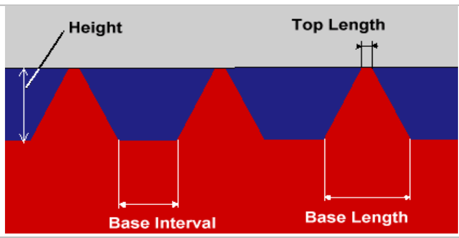
### 3.7.3.5 Teeth



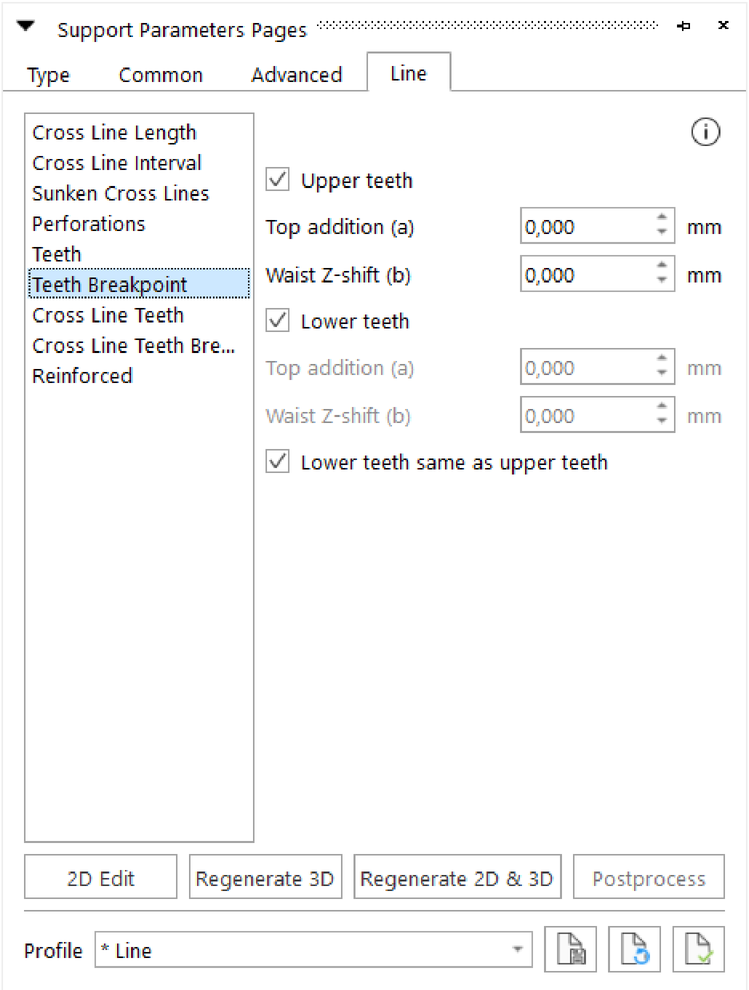



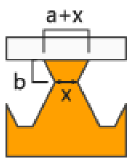

To facilitate the removal of the support, support can be equipped with teeth profiles on the top and/or on the bottom.

| | |
|---|---|
| Teeth | In order to remove the supports easily from the part, the line supports are equipped with teeth profiles on the top and on the bottom. |

| | | |
|---|---|---|
| | Upper<br>Lower | You can specify whether you want Upper Teeth and/or Lower Teeth. Those Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Height<br>Top Length<br>Base Length<br>Base Interval |  |
| | Lower Teeth Same as Upper Teeth | The Lower Teeth have the same specifications as the Upper Teeth. |
| | Full teeth in ends | You can decide to have a full tooth at the end of a support, instead of half a tooth. |

### 3.7.3.6 Teeth breakpoint

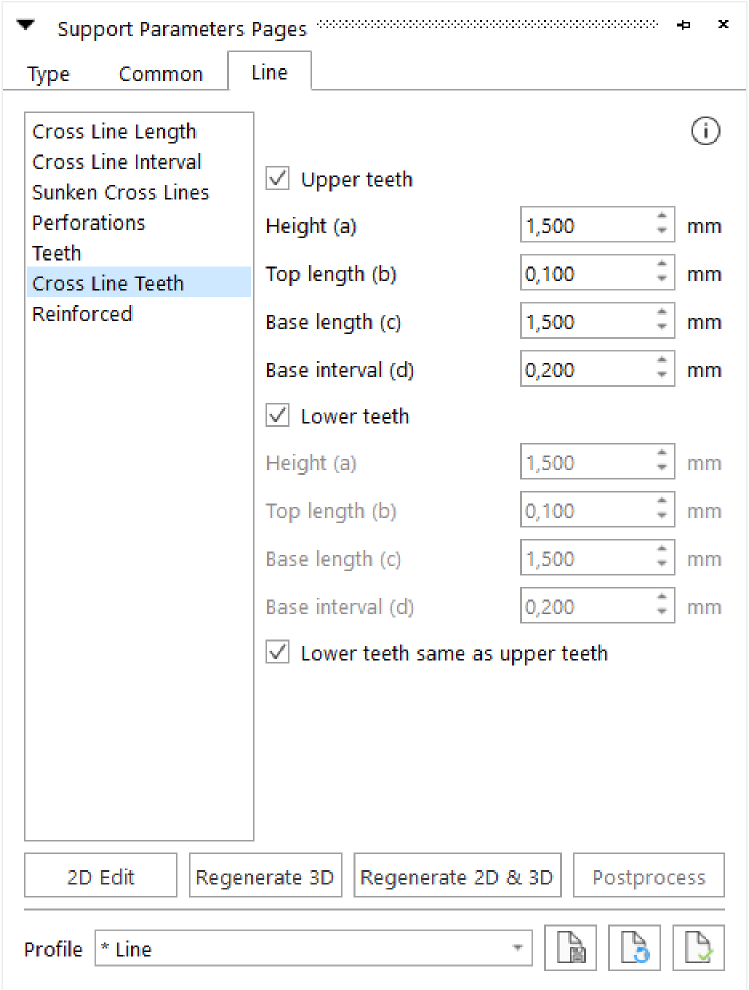


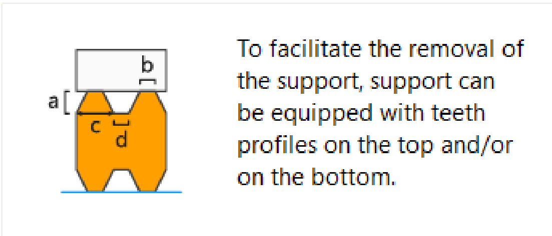



Create breakpoints on teeth to break the support on these points and easily remove it.
Note: X value corresponds to the Top length parameter defined in Teeth page.

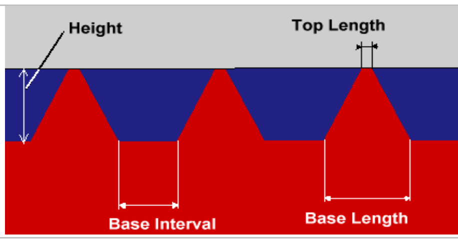
| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

### 3.7.3.7 Cross line teeth

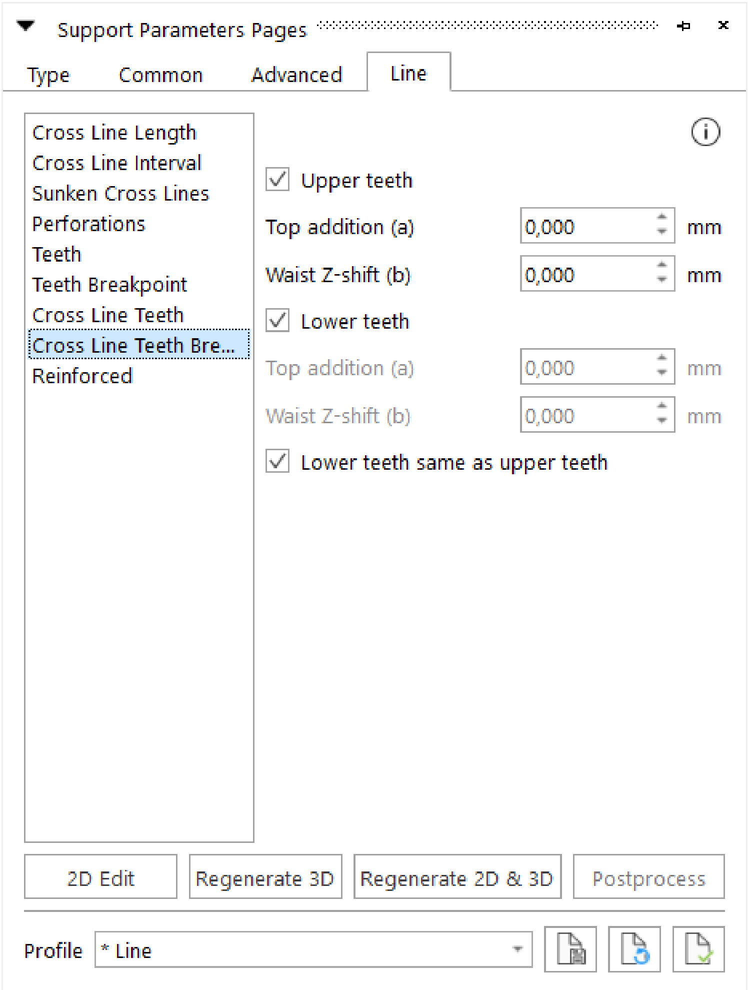


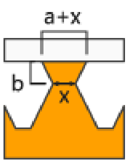




| | | |
|---|---|---|
| Cross Line Teeth | These parameters are exactly the same as the teeth but they will be applied only for the cross lines used in line supports. | |
| | Upper | You can specify whether you want Upper Teeth and/or Lower Teeth. Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Lower | |
| | Height | |
| | Top Length | |
| | Base Length | |

| | | |
|---|---|---|
| | Base Interval |  |
| | Lower Teeth Same as Upper Teeth | The Lower Teeth have the same specifications as the Upper Teeth. |

### 3.7.3.8 *Cross line teeth breakpoint*

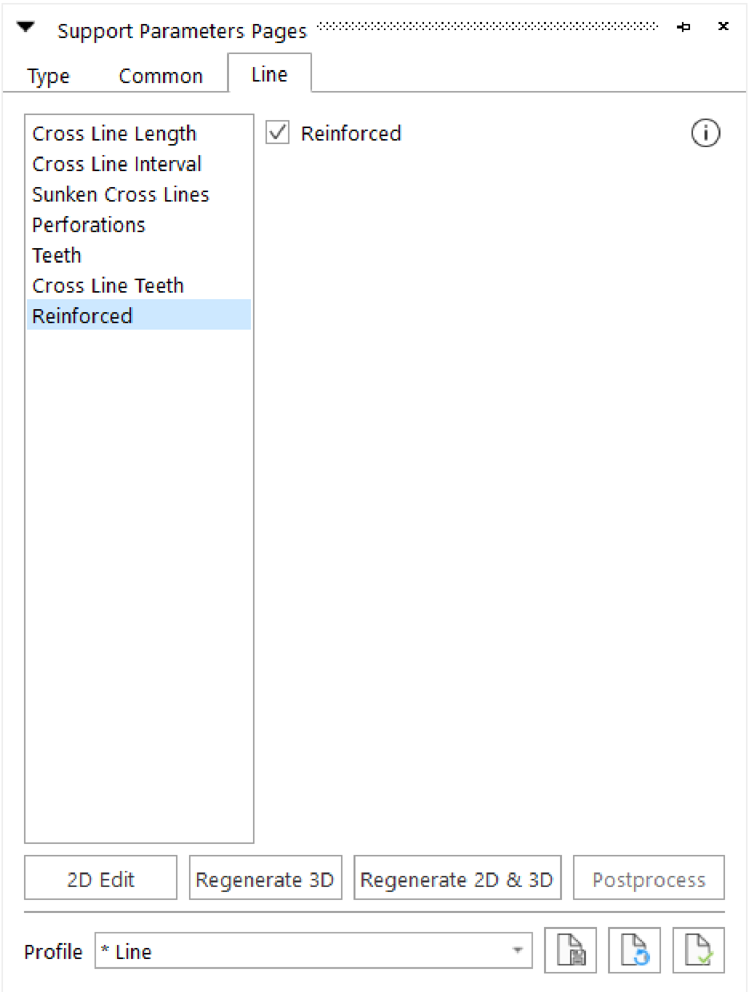



Create breakpoints on teeth to break the support on these points and easily remove it.
Note: X value corresponds to the Top length parameter defined in Teeth page.

| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

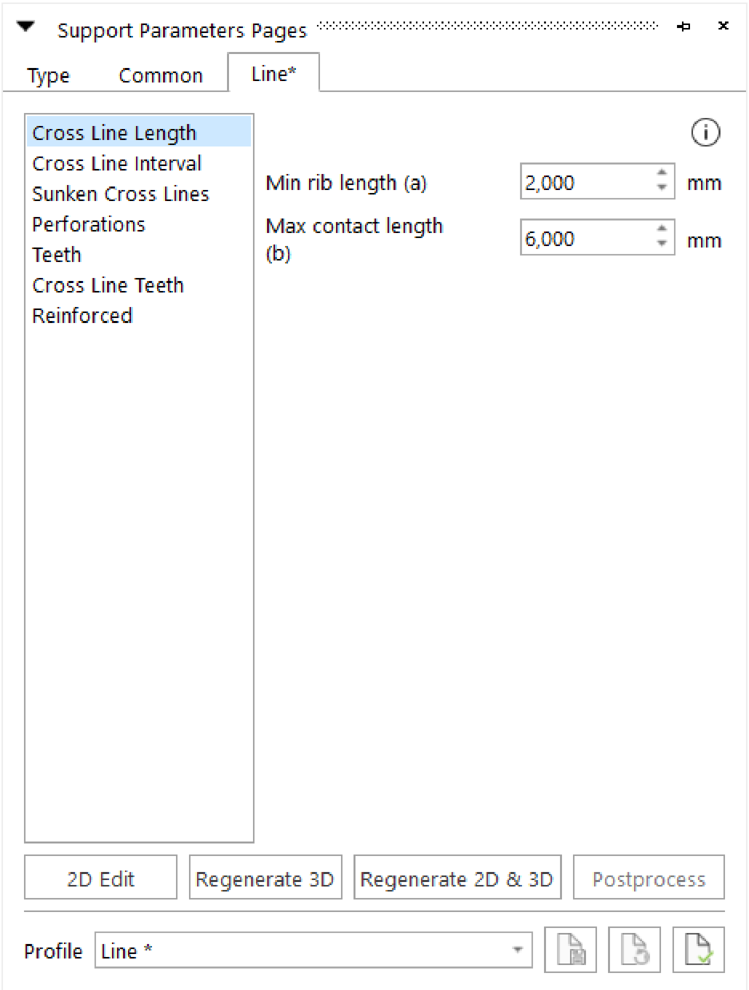
### 3.7.3.9 *Reinforced*

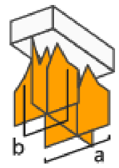



| | |
|---|---|
| Reinforced | You can decide to reinforce a support by adding an extra contour by checking the reinforcement checkbox. This is only done automatically if the height of the surface is bigger than the Reinforcement Height. |

## 3.7.4 Line*

### *3.7.4.1 Cross line length*

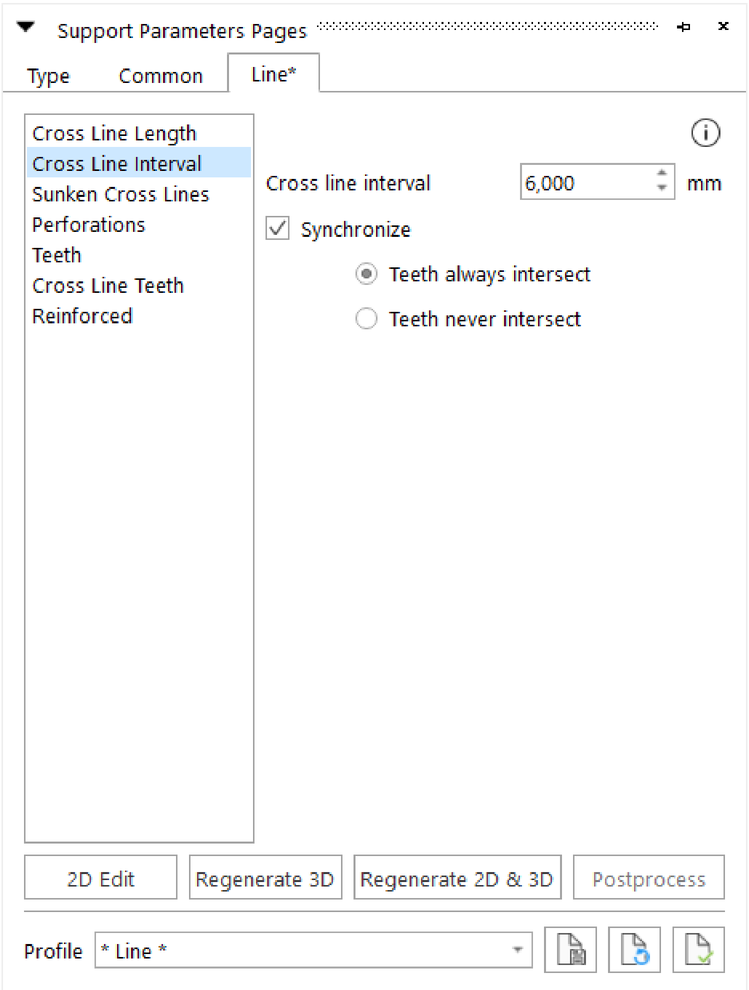


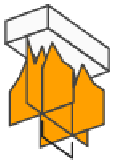



Determine the length of the cross line, taking into account that large cross lines are more stable but harder to remove, and define the length of the contact between the cross line and the surface.

| | | |
|---|---|---|
| Cross line length | Here, you can enter the length of the crossing lines. | |
| | Minimum Rib Length | The length of the crossing lines. |
| | Maximum Contact Length | The contact length of the crossing lines with the support. |

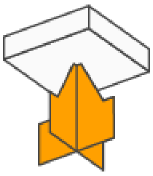
### 3.7.4.2 *Cross line interval*





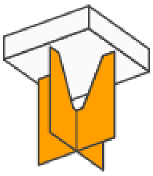
**Cross line interval**

Define the distance between two consecutive cross lines of a line support.



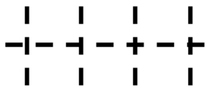
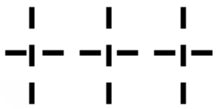
**Teeth always intersect**

Cross line teeth and central line teeth intersect each other right in the middle.

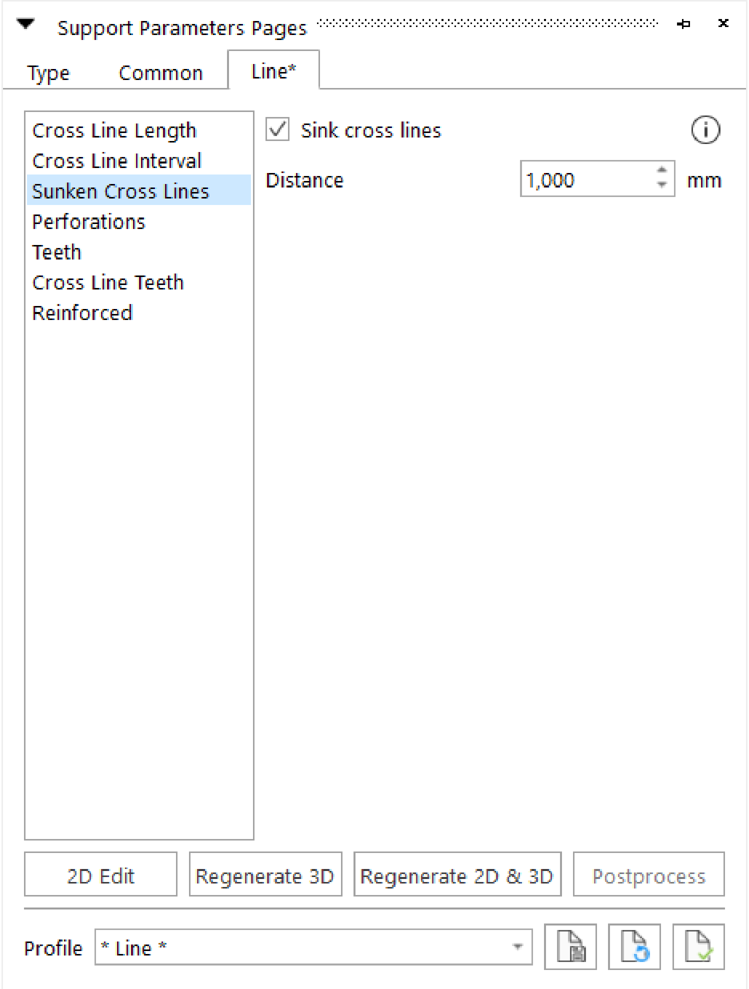


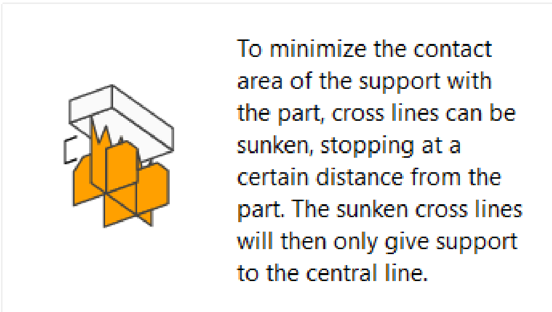
**Teeth never intersect**

Cross line teeth and central line teeth never intersect each other.

<table>
<tr><td>Cross line interval</td><td colspan="3">Here you can set the distance between two consecutive cross lines of a line support.</td></tr>
<tr><td></td><td rowspan="3">Synchronize</td><td colspan="2">The user can allow the synchronization of the teeth of the cross lines and the teeth of the central line.<br>An example of Line support without synchronization is shown below.<br></td></tr>
<tr><td></td><td>Teeth Always Intersect</td><td>The teeth of the cross lines and the central line cross each other right in the middle.<br></td></tr>
<tr><td></td><td>Teeth Never Intersect</td><td>The teeth of the cross lines avoid to cross the teeth of the central line.<br></td></tr>
<tr><td></td><td>Upper and lower teeth synchronization</td><td colspan="2">Upper and lower teeth will be synchronized</td></tr>
</table>

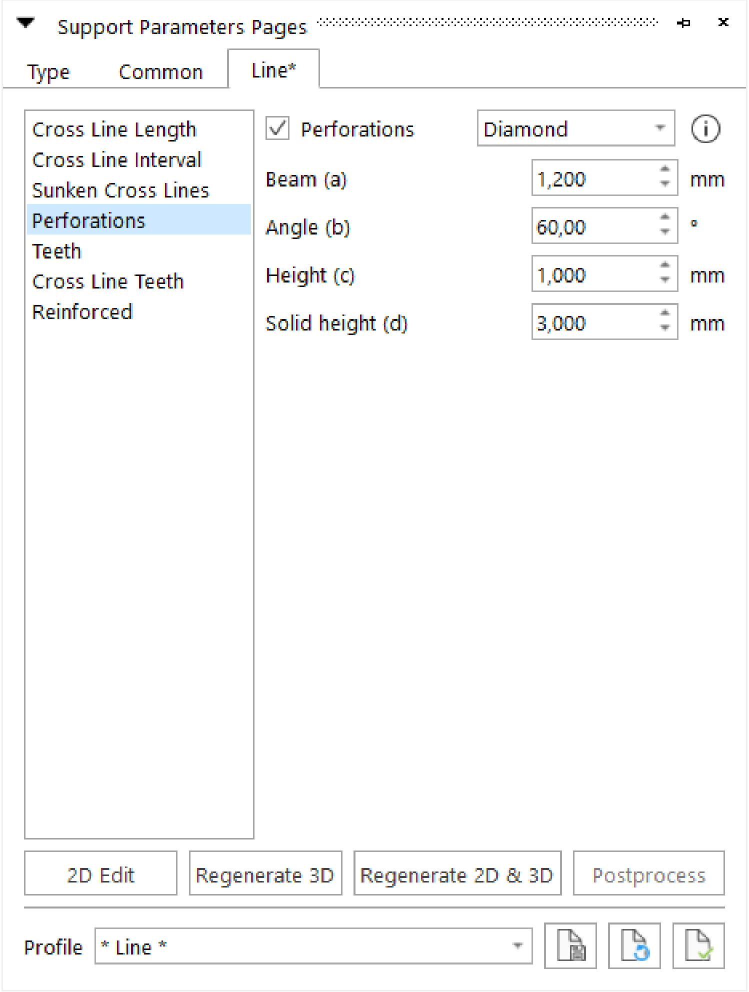
### 3.7.4.3 Sunken cross lines

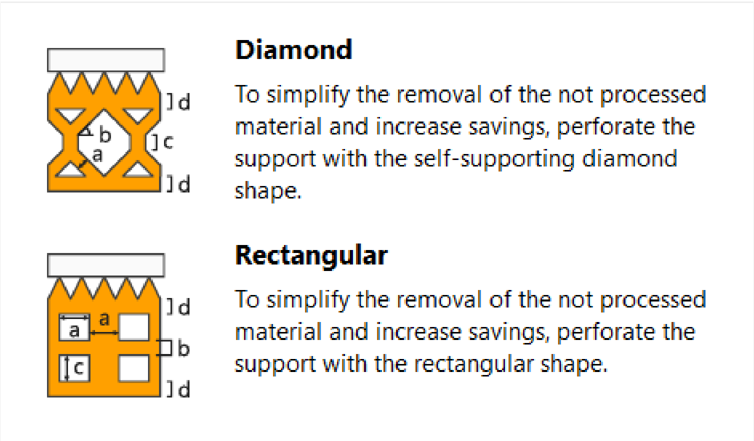


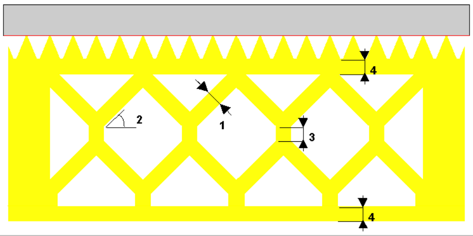
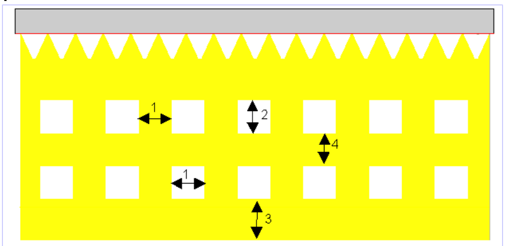

| | | |
|---|---|---|
| Sunken Cross Lines | To minimize the contact area of the support with the parts, the cross lines can be sunken, this means that they will not go till the part. They will stop at a certain distance before the part. | |
| | Distance | The distance that a sunken cross line will stop before the part. |

## *3.7.4.4 Perforations*



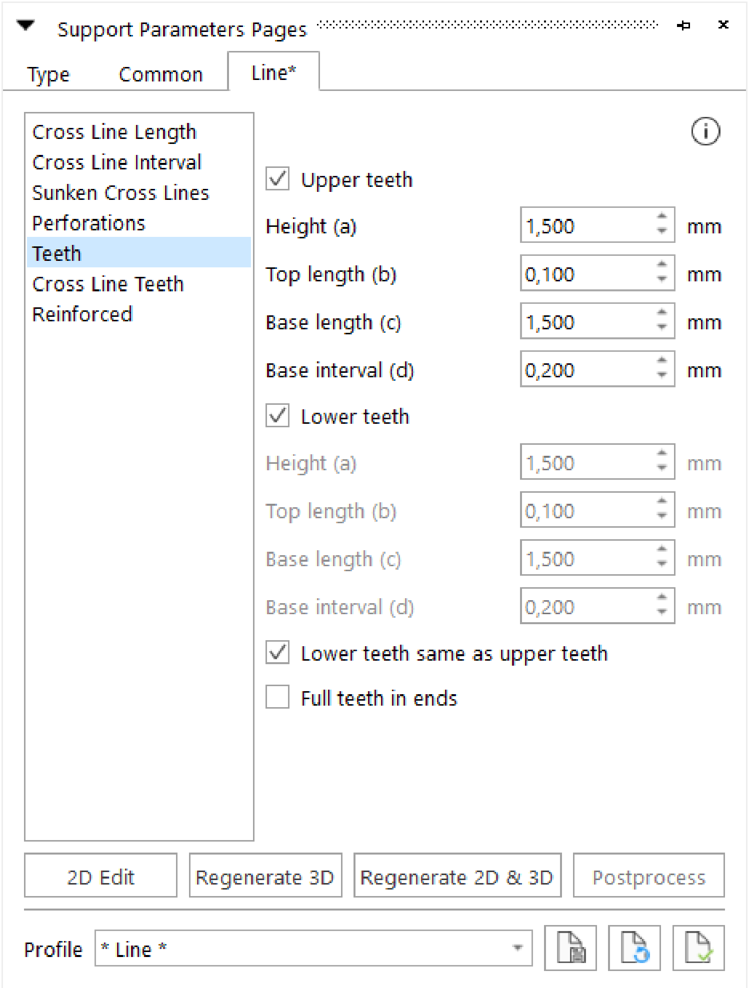



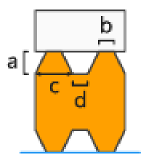

| | |
|---|---|
| Perforations | If this option is checked, the support will be perforated. There are two kind of perforations possible: |

| | | | |
|---|---|---|---|
| | Diamond | The shape and the size of the perforations are user defined by setting four parameters:<br><br> | |
| | | Beam | The beam thickness (1) defines the thickness of the beams. |
| | | Angle | The perforation angle (2) determines the angle of the perforations |
| | | Height | The height (3) of the vertical part is set with this parameter. |
| | | Solid Height | The separate parameter Solid Height (4) guarantees a good connection to the platform and the teeth. |
| | Rectangular | The shape and the size of the perforations are user defined by setting four parameters:<br><br> | |
| | | Width | The width parameter (1) defines the width of the rectangular holes. |
| | | Height | The Height parameter (2) defines the height of the rectangular holes |
| | | Solid Height | The Solid Height (3) parameter guarantees a good connection to the platform and the part. |
| | | Interval | The interval parameter (4) defines the interval between the holes. |

| | | | |
|---|---|---|---|
| | | Only Perforate… rows | The support will only be perforated for the given rows, starting from the bottom. This enables the drainage of resin and ensures stable supports. |

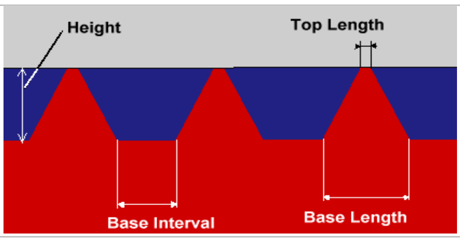
### 3.7.4.5 Teeth



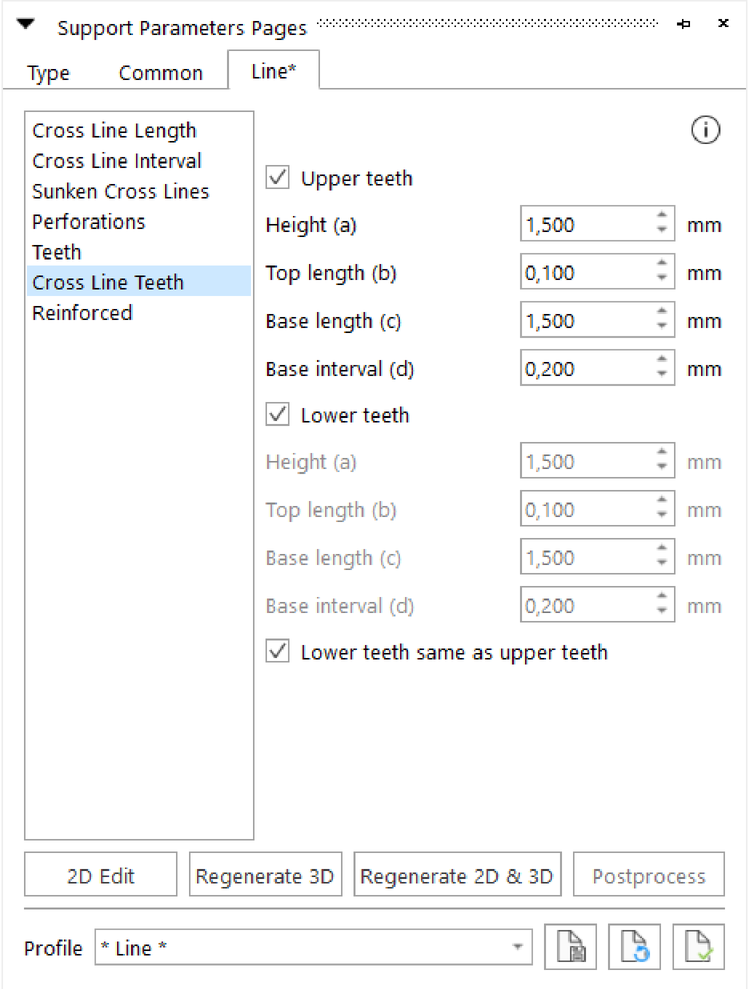



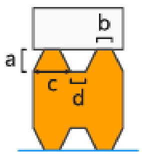

To facilitate the removal of the support, support can be equipped with teeth profiles on the top and/or on the bottom.

| | |
|---|---|
| Teeth | In order to remove the supports easily from the part, the line supports are equipped with teeth profiles on the top and on the bottom. |

| | | |
|---|---|---|
| | Upper | You can specify whether you want Upper Teeth and/or Lower Teeth. Those Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Lower | |
| | Height |  |
| | Top Length | |
| | Base Length | |
| | Base Interval | |
| | Lower Teeth Same as Upper Teeth | The Lower Teeth have the same specifications as the Upper Teeth. |
| | Full teeth in ends | You can decide to have a full tooth at the end of a support, instead of half a tooth. |

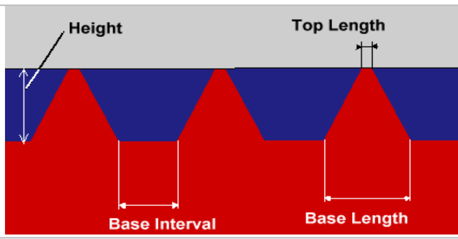
### 3.7.4.6 Cross line teeth



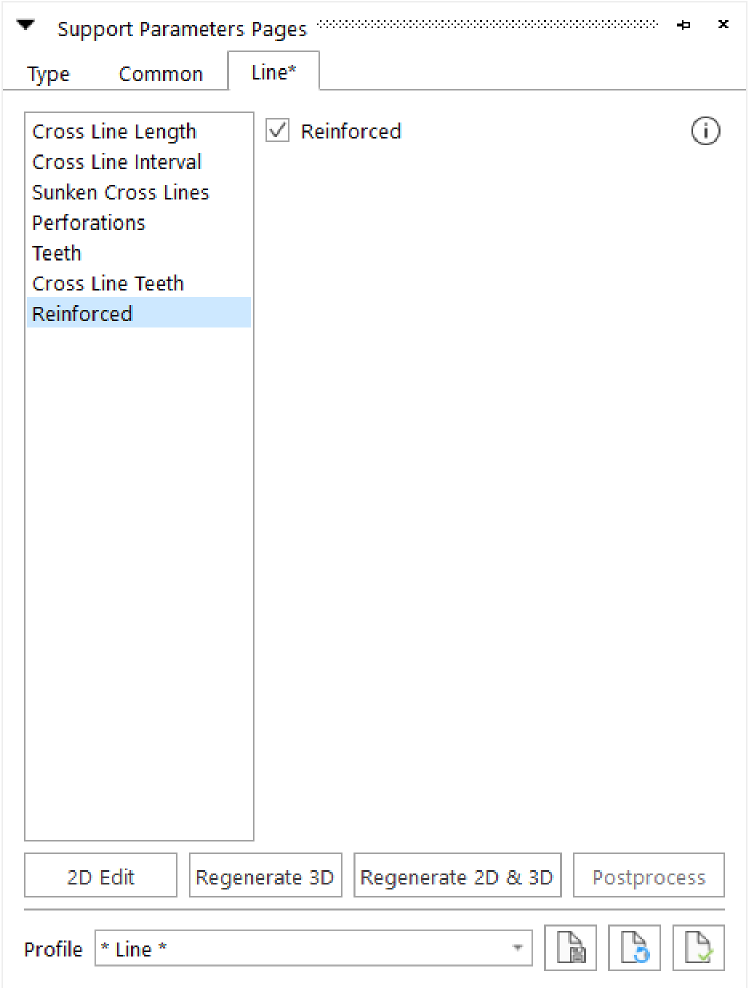




To facilitate the removal of the support, support can be equipped with teeth profiles on the top and/or on the bottom.

| | | |
|---|---|---|
| Cross Line Teeth | These parameters are exactly the same as the teeth but they will be applied only for the cross lines used in line supports. | |
| | Upper | You can specify whether you want Upper Teeth and/or Lower Teeth. Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Lower | |
| | Height | |
| | Top Length | |
| | Base Length | |

| | | |
|---|---|---|
| | Base Interval |  |
| | Lower Teeth Same as Upper Teeth | The Lower Teeth have the same specifications as the Upper Teeth. |

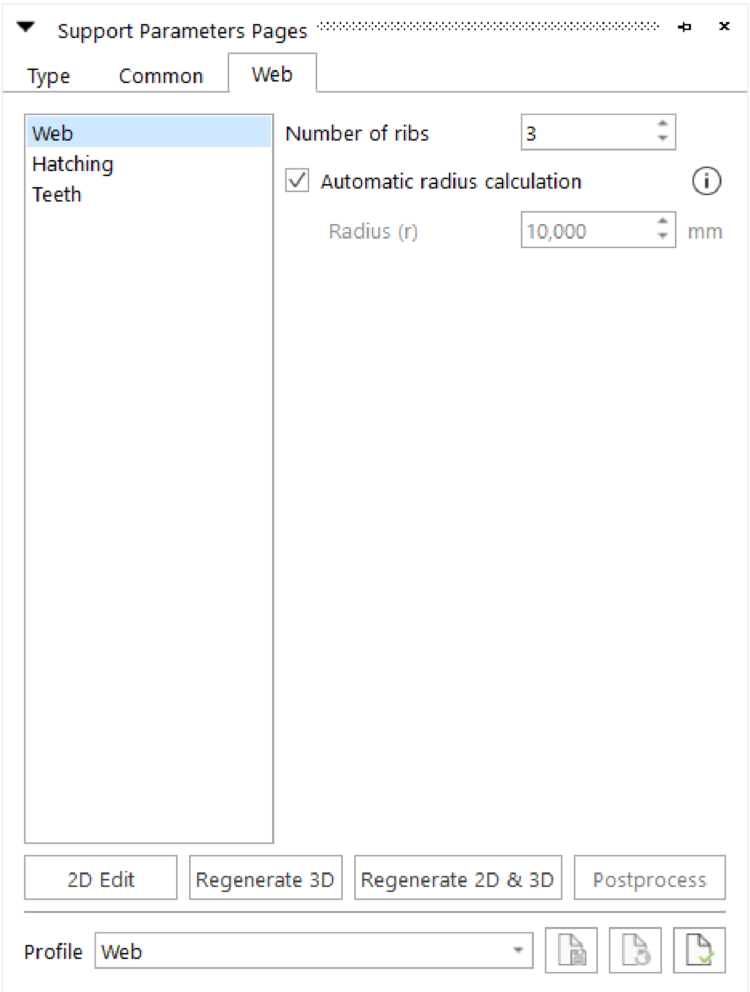
### 3.7.4.7 Reinforced

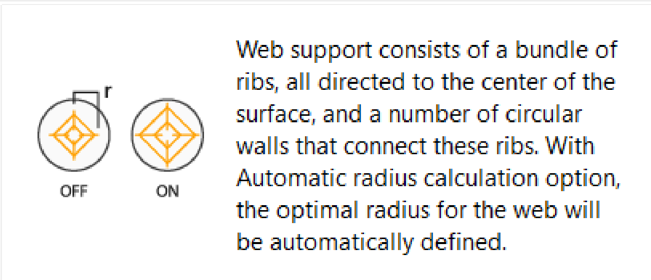


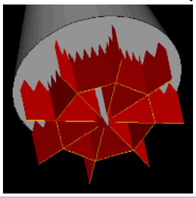

| | |
|---|---|
| | You can decide to reinforce a support by adding an extra contour by checking the reinforcement checkbox. This is only done automatically if the height of the surface is bigger than the Reinforcement Height. |

## 3.7.5 Web

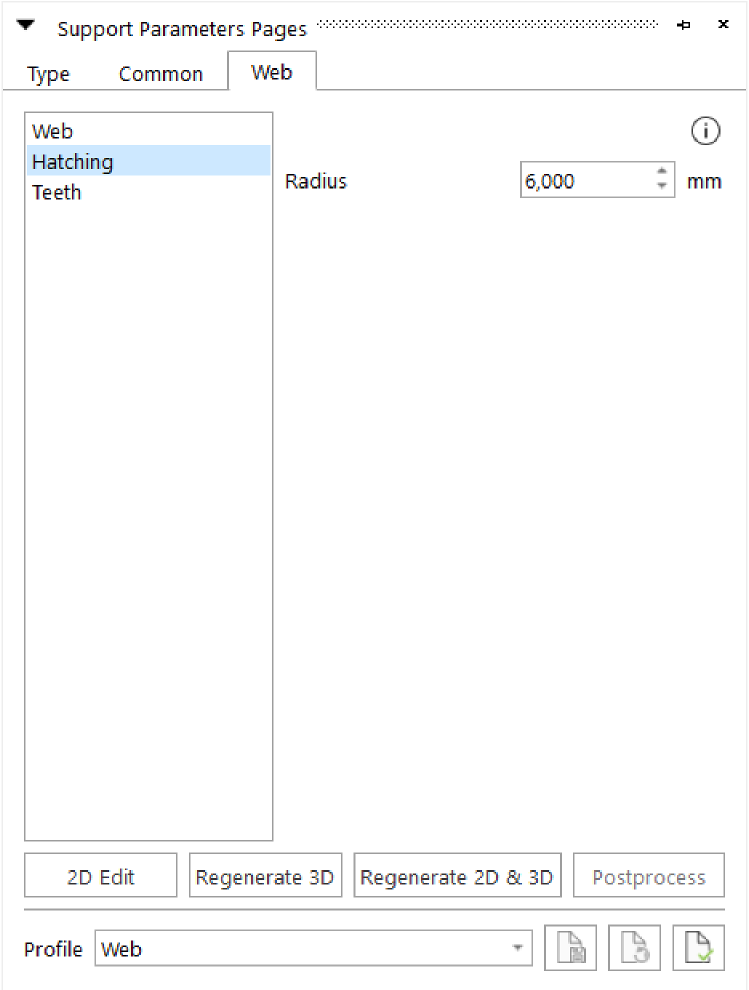
### *3.7.5.1 Web*

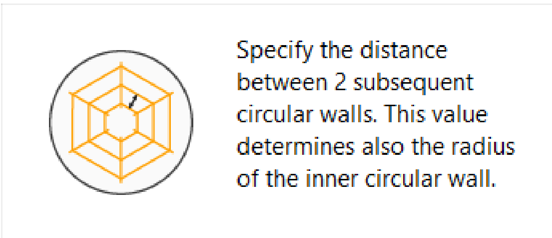


| | | |
|---|---|---|
| Web | A web support consists of a bundle of walls crossing one another in the center of the surface, the ribs, and a number of circular walls, which connect these ribs at specified intervals. Since the circular walls cross the ribs, the latter can be omitted near the center of the surface, enabling an easier removal of the supports afterwards.  | |
| | Number of Ribs | This parameter specifies the number of ribs. |
| | Radius | This parameter specifies the length of the ribs from the center to the border of the surface. |
| | Automatic Radius Calculation | The radius is automatically calculated, it is the local width decreased with the XY-offset value. |

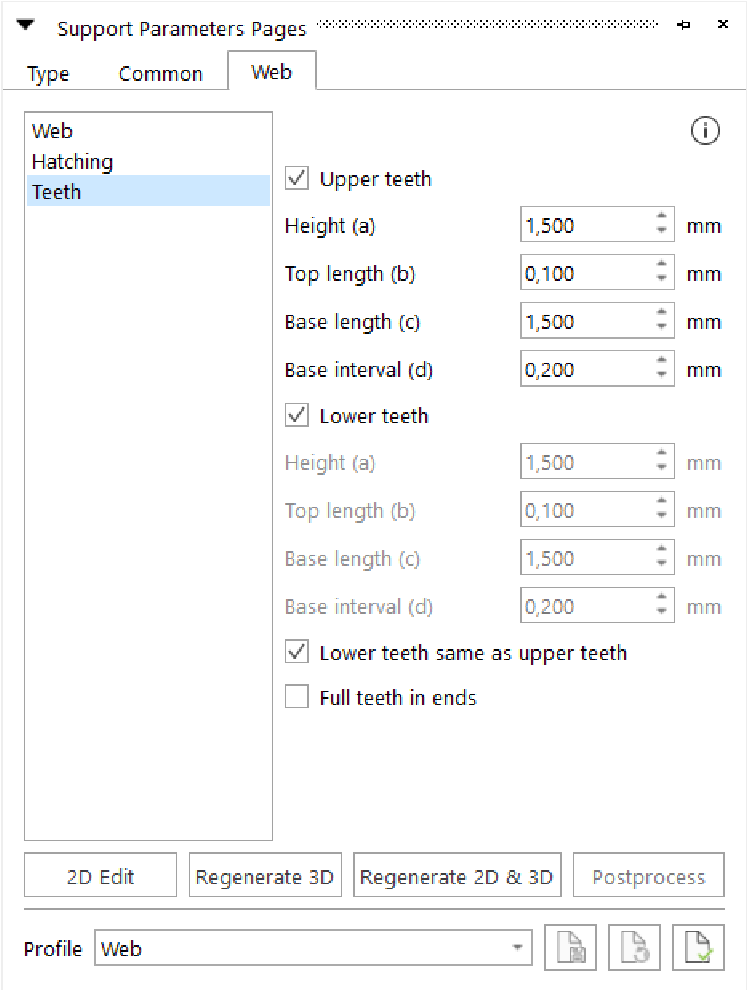
### 3.7.5.2 Hatching

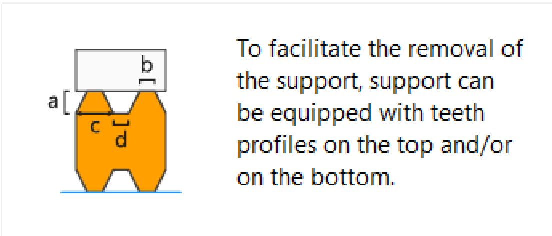


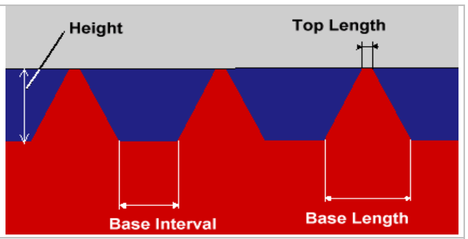

| | |
|---|---|
| Hatching | This parameter specifies the distance between 2 subsequent circular walls. It also determines the radius of the inner circular wall. |

### 3.7.5.3 Teeth

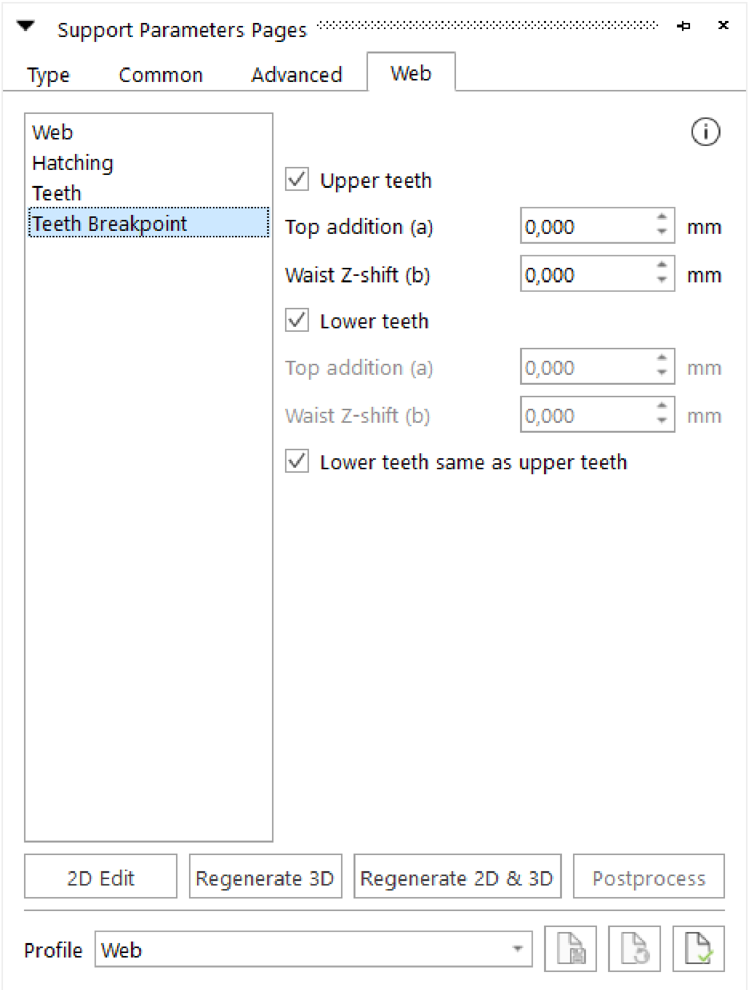


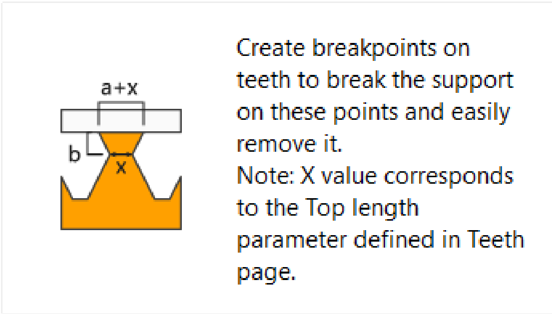




| | | |
|---|---|---|
| Teeth | In order to remove the supports easily from the part, the web supports are equipped with teeth profiles on the top and on the bottom. | |
| | Upper | You can specify whether you want Upper Teeth and/or Lower Teeth. Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Lower | |
| | Height | |
| | Top Length | |

| | | |
|---|---|---|
| | Base Length<br>Base Interval |  |
| | Lower Teeth Same as Upper Teeth | The Lower Teeth have the same specifications as the Upper Teeth. |
| | Full teeth in ends | You can decide to have a full tooth at the end of a support, instead of half a tooth. |

### 3.7.5.4 Teeth breakpoint

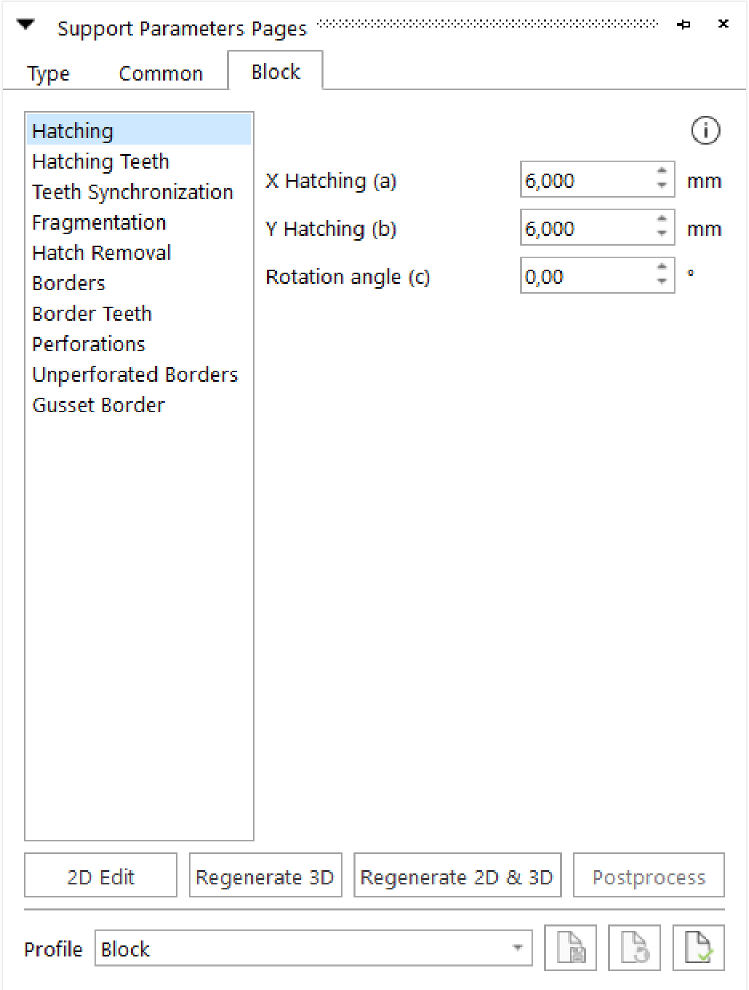


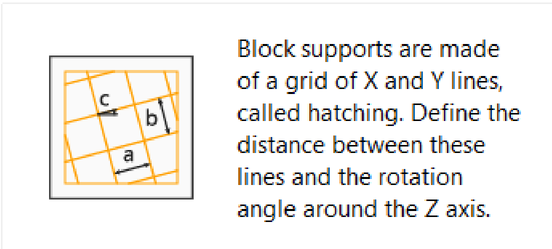


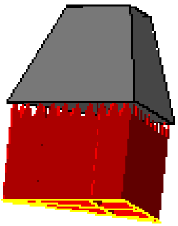
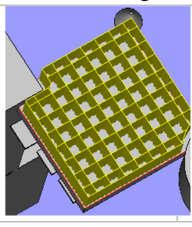
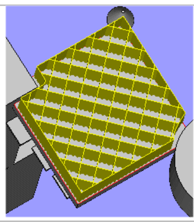

| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

## 3.7.6 Block

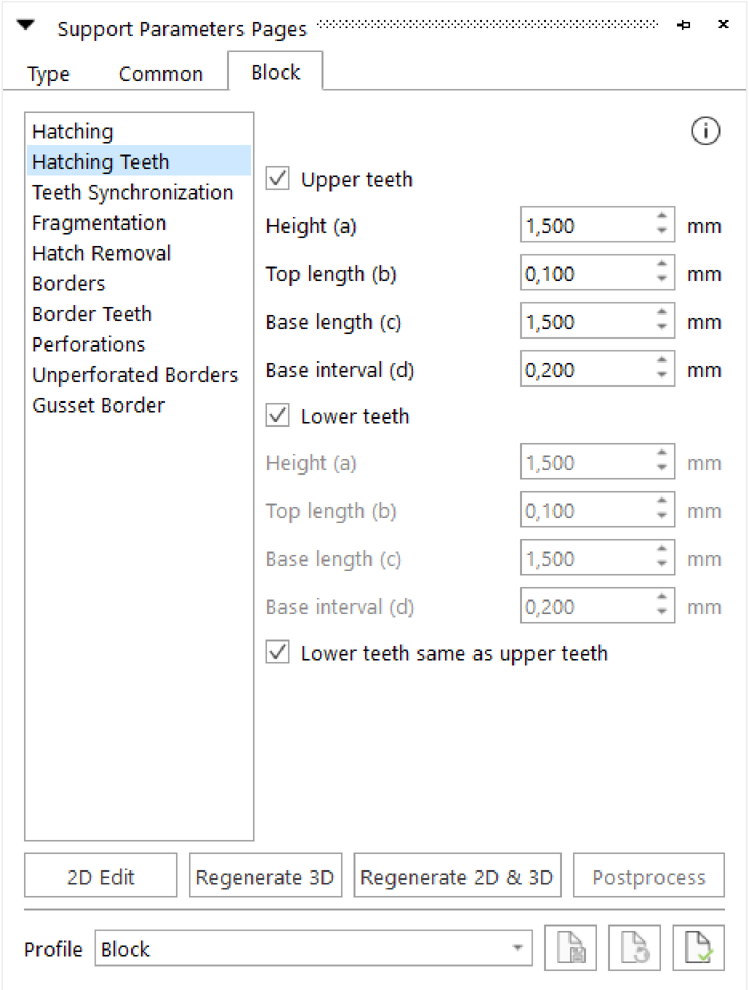
### *3.7.6.1 Hatching*

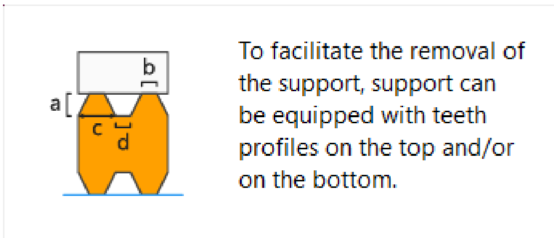


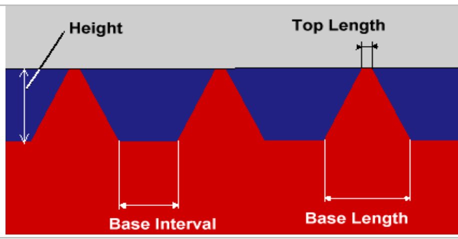
| | | |
|---|---|---|
| Hatching | Block Supports are generated for larger surfaces, they are made with a grid of X and Y lines which are separated at a certain distance (X Hatching and Y  Hatching). | |
| | X Hatching<br>Y Hatching | The distance between two X or Y hatchings. You can add 4 constraints to adjust the hatching distance depending on the surface dimensions. |
| | Rotation Angle | The hatchings on the first picture have no angle and they are parallel to the X- and Y-axes. On the second picture, they have an angle of 45°.<br>  |

### 3.7.6.2 Hatching teeth

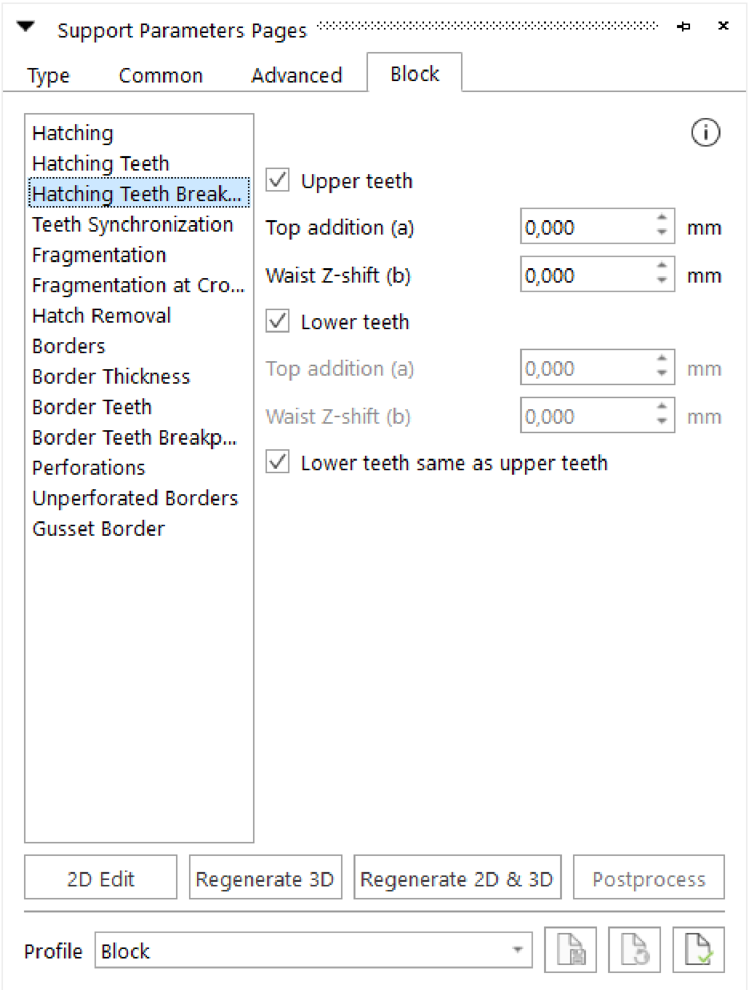


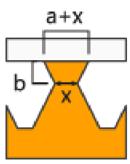




<table>
<tr><td rowspan="6">Hatching teeth</td><td colspan="2">In order to remove the supports easily from the part, the hatchings are equipped with teeth profiles on the top and on the bottom.</td></tr>
<tr><td>Upper</td><td rowspan="2">You can specify whether you want Upper Teeth and/or Lower Teeth. Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth.</td></tr>
<tr><td>Lower</td></tr>
<tr><td>Height</td><td rowspan="3"></td></tr>
<tr><td>Top Length</td></tr>
<tr><td>Base Length</td></tr>
</table>

| | | |
|---|---|---|
| | Base Interval |   |
| | Lower Teeth Same as Upper Teeth | The Lower Teeth have the same specifications as the Upper Teeth. |
| | Full teeth in ends | You can decide to have a full tooth at the end of a support, instead of half a tooth. |

### *3.7.6.3 Hatching teeth break point*

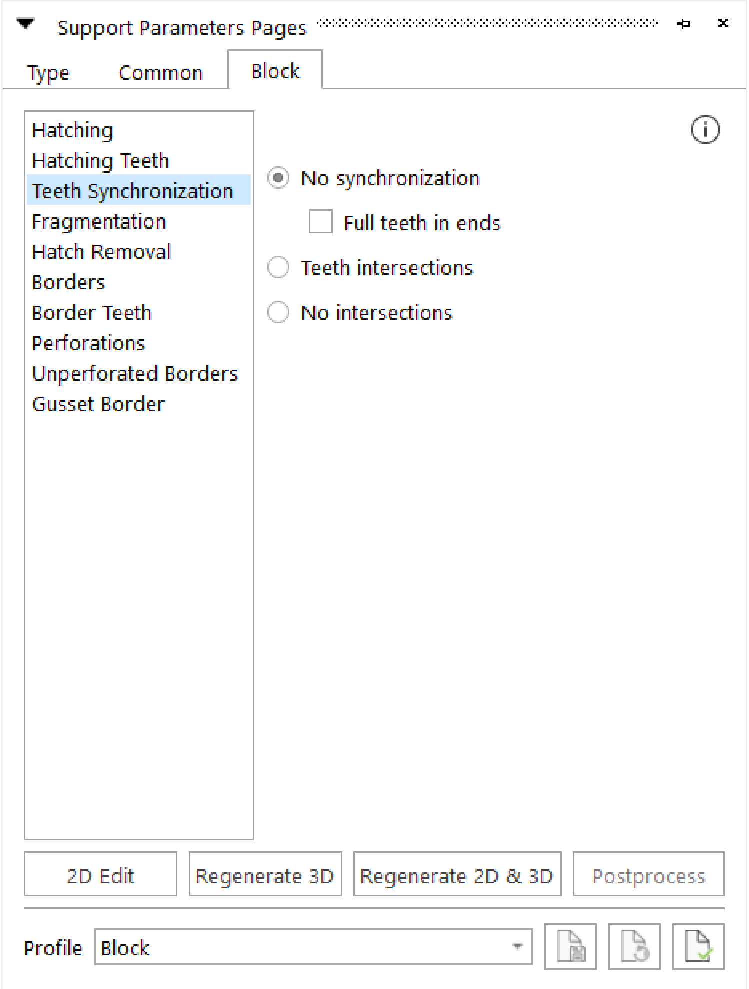


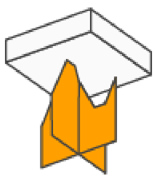



Create breakpoints on teeth to break the support on these points and easily remove it.
Note: X value corresponds to the Top length parameter defined in Teeth page.

| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

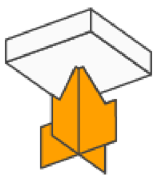
### 3.7.6.4 Teeth synchronization



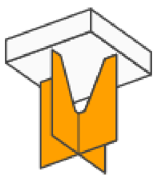
**No synchronization**

No synchronization method is defined when teeth of X and Y hatching intersect each other.



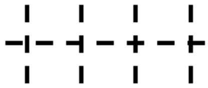
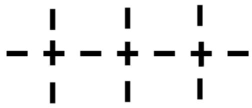
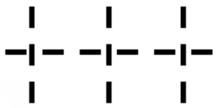
**Teeth intersection**

Teeth of X and Y hatching intersect each other right in the middle.

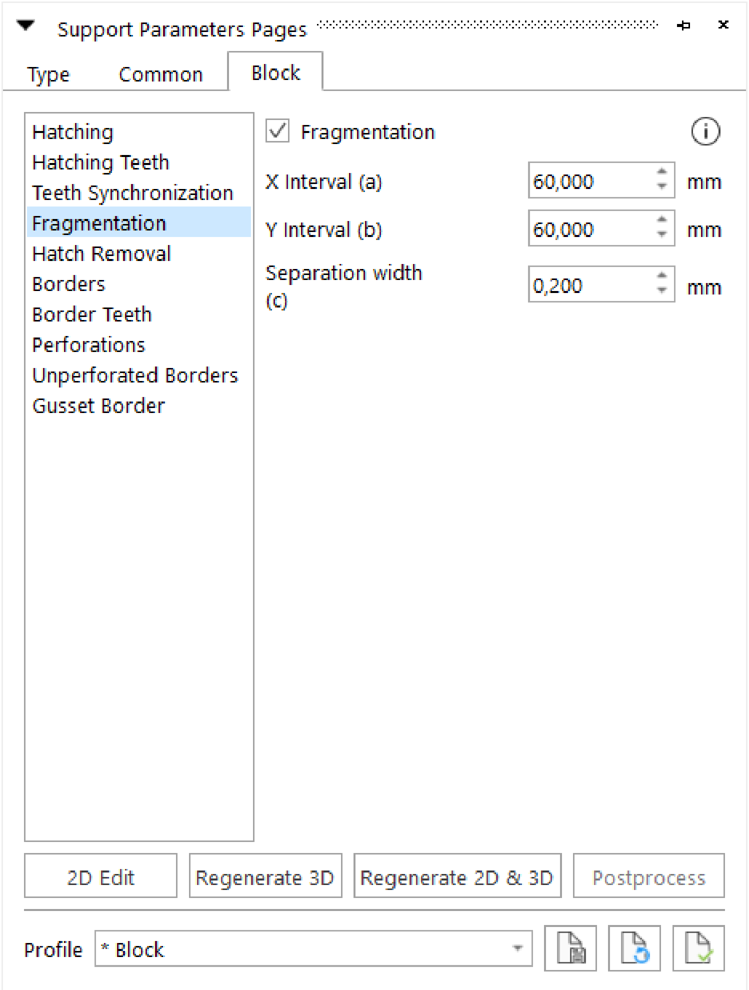


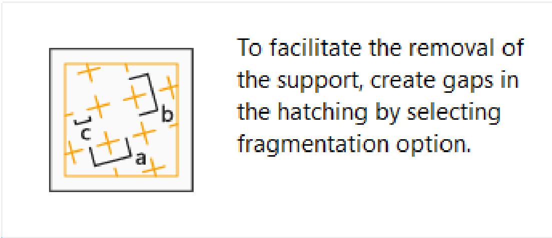
**No intersection**

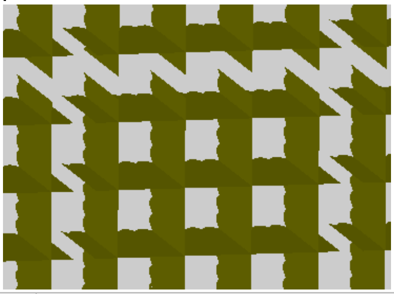
Teeth of X and Y hatching never intersect each other.

| | | |
|---|---|---|
| Teeth synchronization | The user can allow the synchronization of the teeth of the cross lines and the teeth of the central line. | |
| | No Synchronization |  |
| | Teeth Intersections |  |
| | No Teeth Intersections |  |

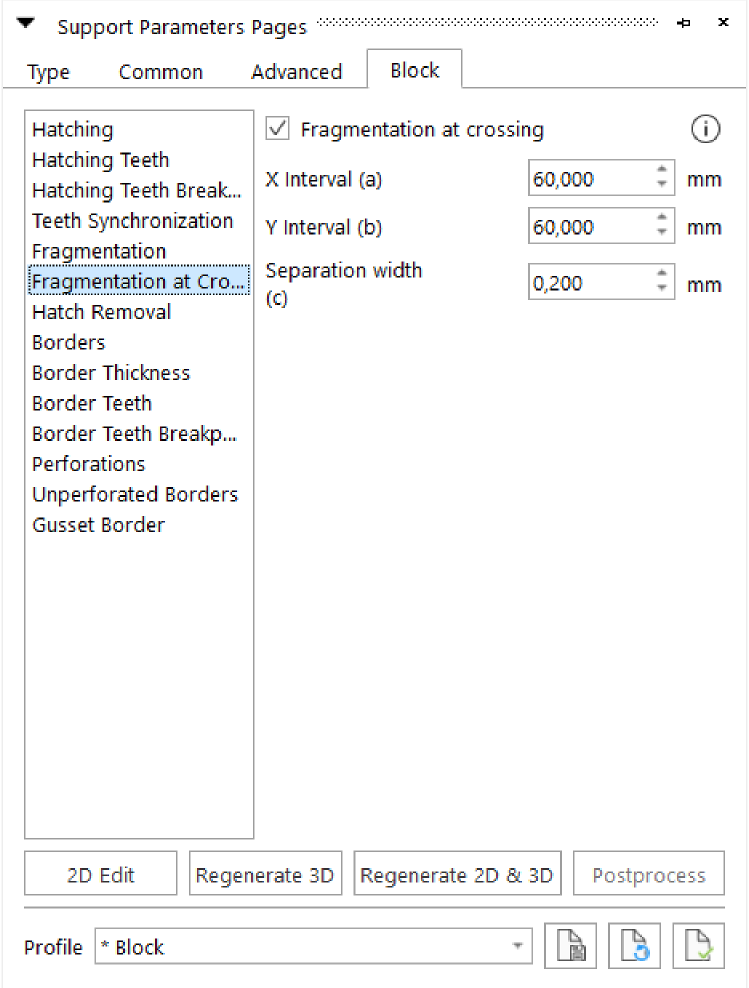
### 3.7.6.5 *Fragmentation*

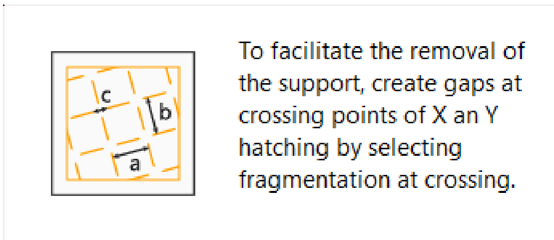





| | | |
|---|---|---|
| Fragmentation | Fragmentation will leave a small gap in the hatching of the block support each chosen distance, so the removal of block supports will become a lot easier.  | |
| | X Interval | The interval of the gaps according the X direction. |
| | Y Interval | The interval of the gaps according the X direction. |
| | Separation Width | The width of the gaps in the hatching. |
| | Fragmentate Borders | Check this option if you want the borders to be fragmentized too. |

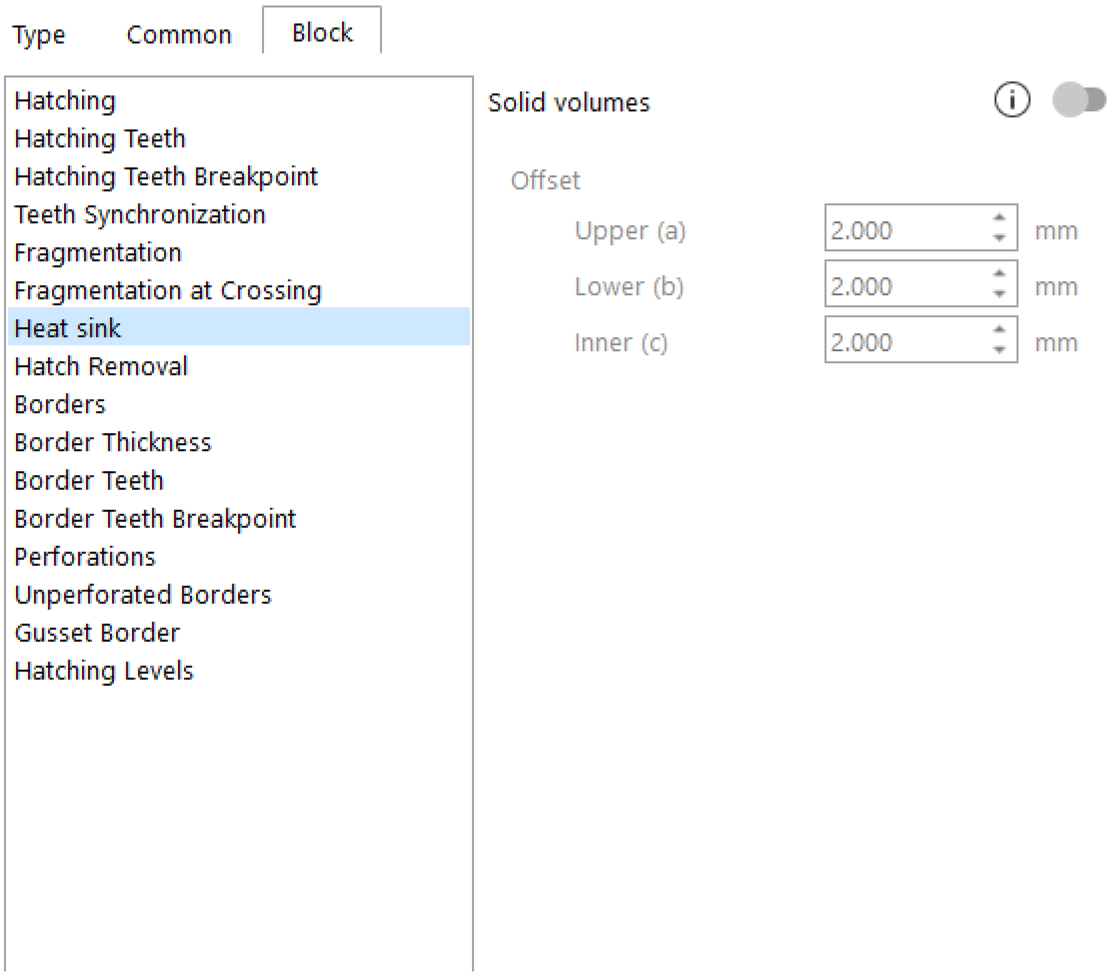
### 3.7.6.6 Fragmentation at crossing

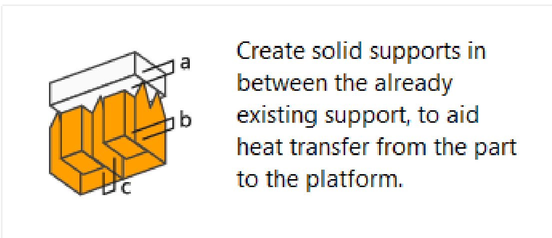



| | | |
|---|---|---|
| Fragementate at crossings | Fragmentation will leave a small gap in the hatching of the block support each chosen distance | |
| | X interval | The interval of the gaps according the X direction. |
| | Y interval | The interval of the gaps according the X direction. |
| | Separation width | The width of the gaps in the hatching. |
| | Fragmentate borders | Check this option if you want the borders to be fragmentized too. |

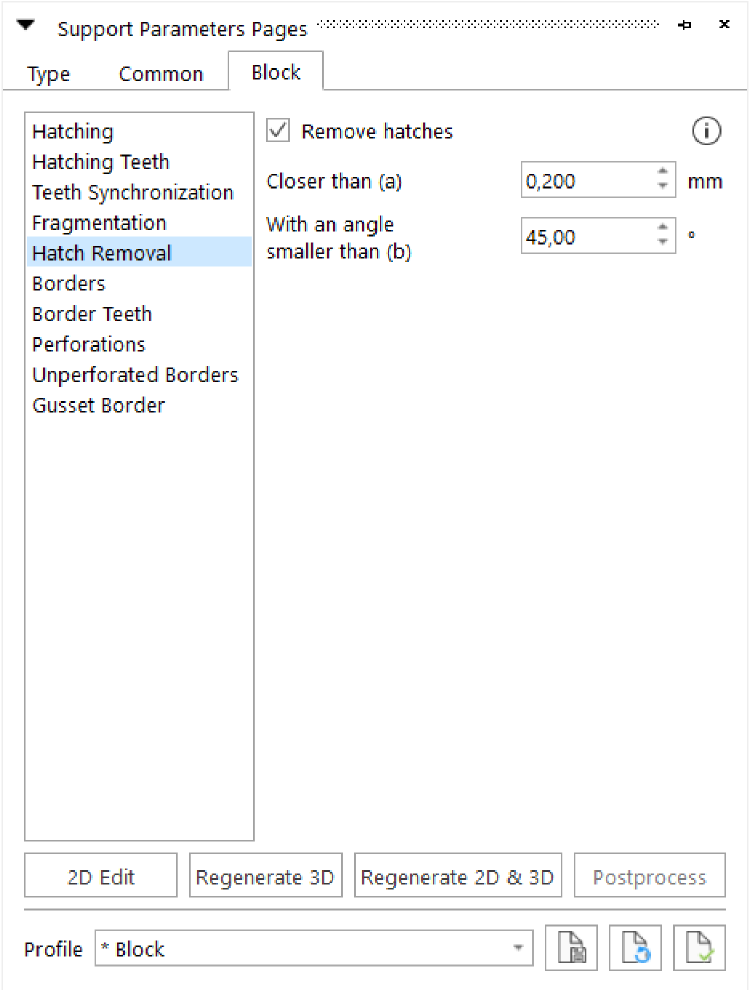
## 3.7.6.7 Heat sink

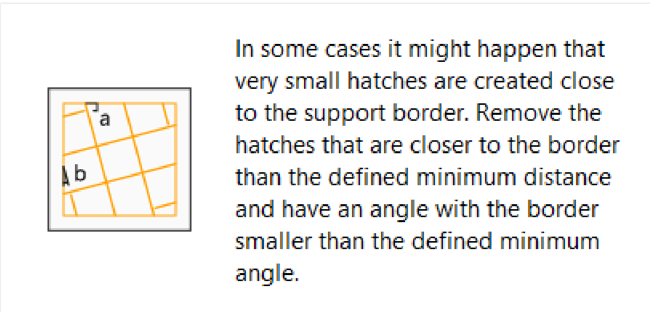


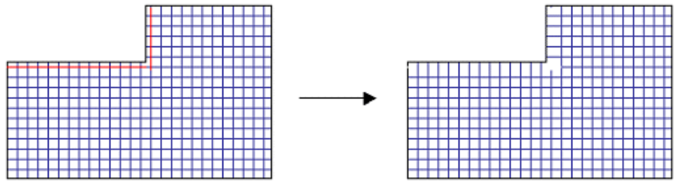

| | |
|---|---|
| Solids supports | Supports are reinforced by adding solid supports in between the already existing supports |
| Upper | Distance between the part and heat transferring support |
| Lower | Distance between the heat transferring support and the platform |
| Inner | Distance between existing support and the heat transferring support |

### 3.7.6.8 Hatch removal

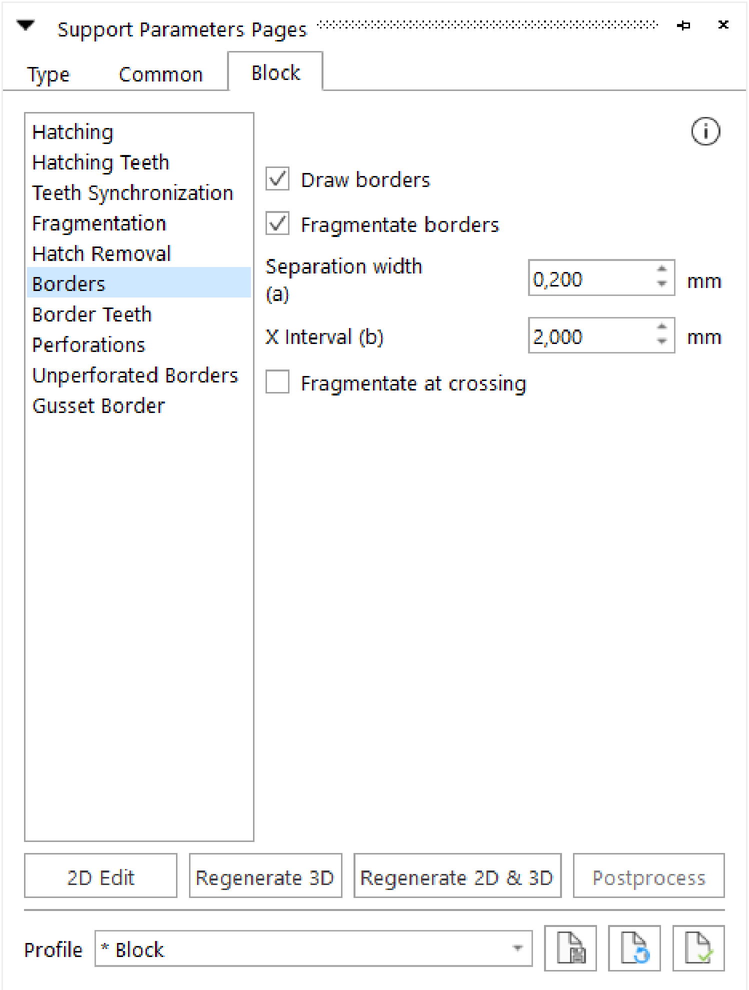


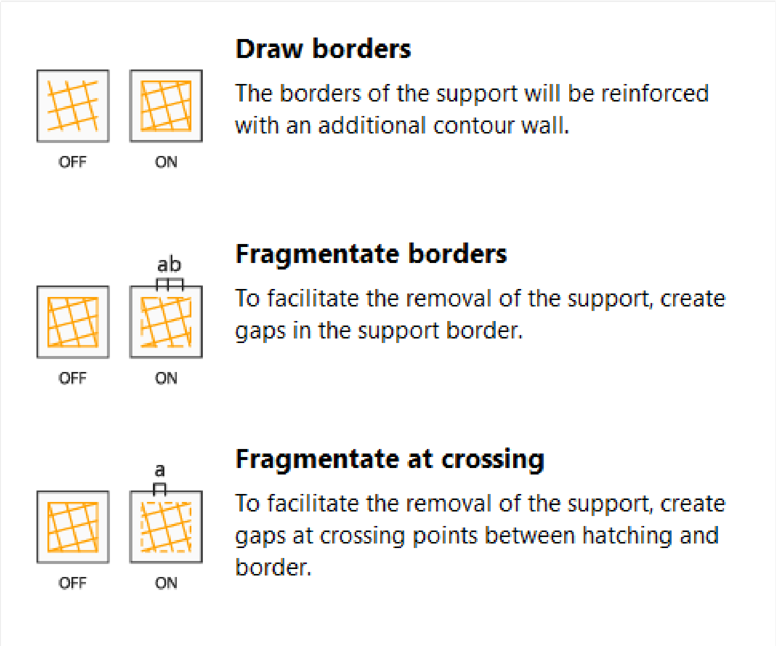



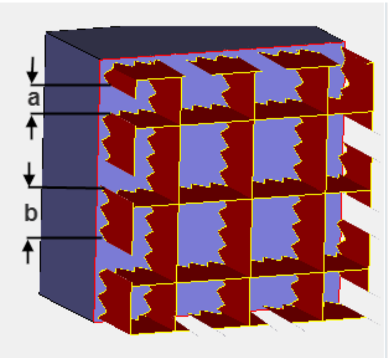
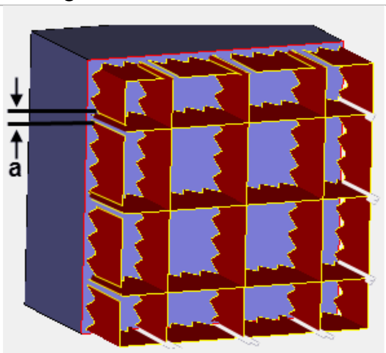

| | | |
|---|---|---|
| Hatch Removal | In case a hatch would be placed too close to the border, problems during the removal of the support can arise. | |
| | Closer Than | Closer Than defines the minimum distance hatching stays away from the border. |
| | With an Angle Smaller Than | Angle defines the minimum angle a rib has to make with the border in order not to be withdrawn with the clearance distance. |

| | |
|---|---|
| |  |

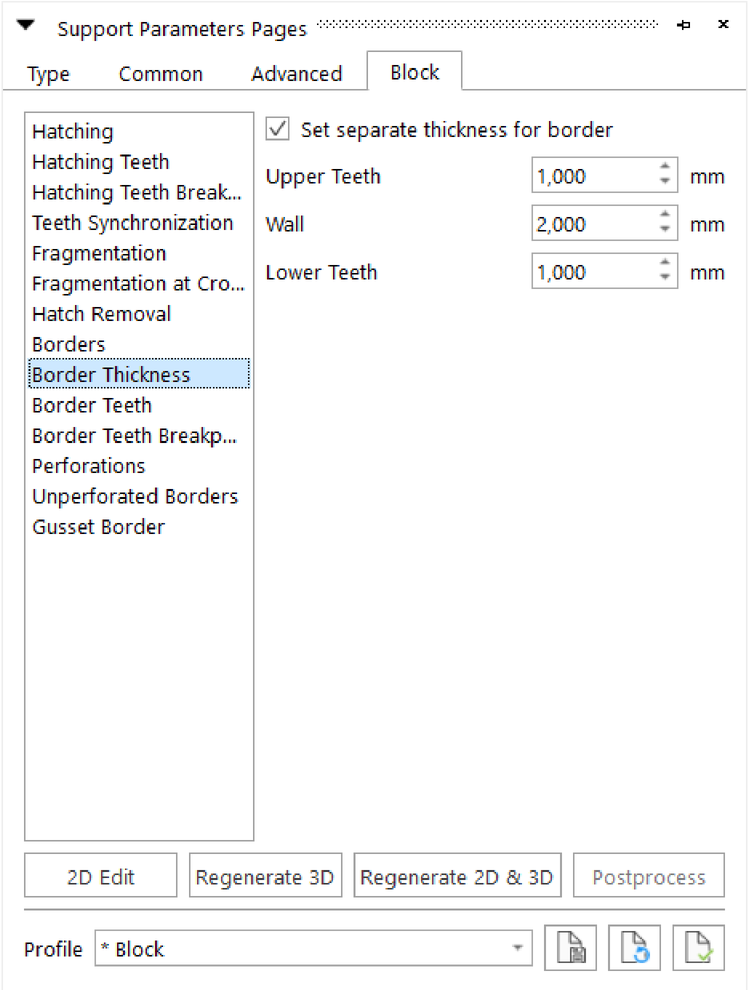
### 3.7.6.9 Borders





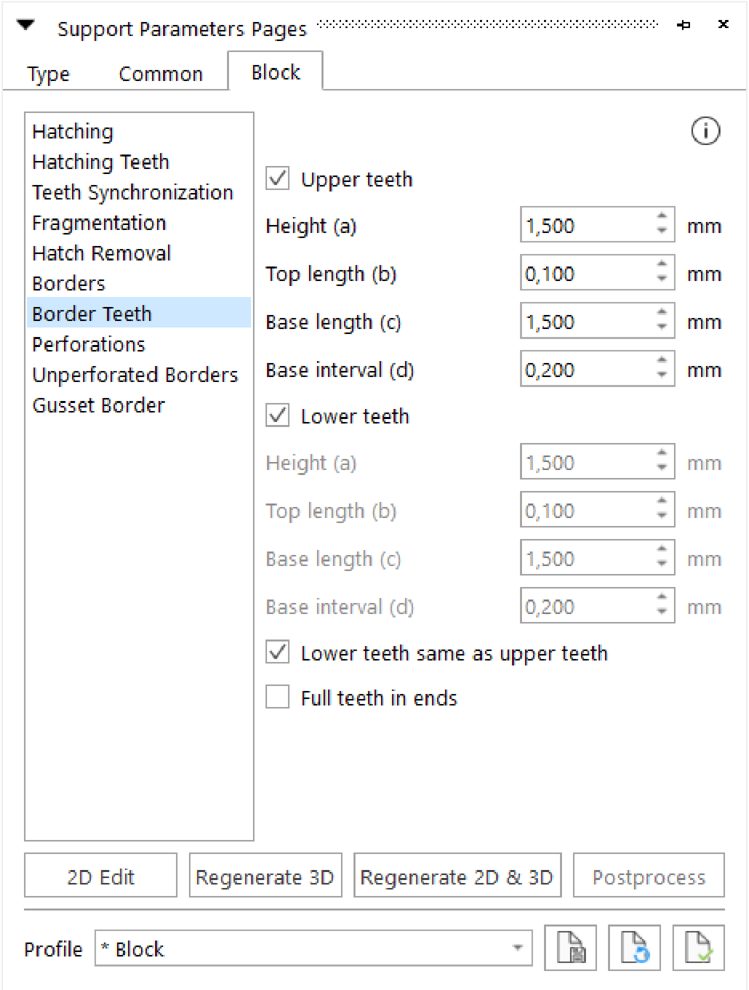

| | | |
|---|---|---|
| Borders | The borders of the support will be reinforced with an additional contour wall. | |
| Fragmentate Borders | Gaps in the border support will be generated |  |
| | Separation Width (a) | Gaps width |
| | Interval (b) | Distance between the end of a gap and the starting of the next |
| Fragmentation at Crossing | Gaps in the border support will be generated just where a crossing point (between hatching and support borders) is located |  |

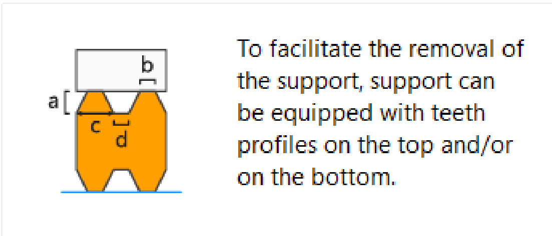
### 3.7.6.10 Border Thickness



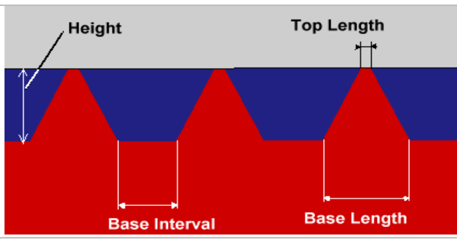

| | | |
|---|---|---|
| Border thickness | Set a separate thickness for a non-solid border | |
| | Upper teeth | Set the thickness of the upper teeth that reach the different upper surfaces |
| | Wall | Set the thickness of the wall in between the upper teeth and platform/ lower teeth. |
| | Lower teeth | Set the thickness of the lower teeth that touches lower surfaces. |

### 3.7.6.11 Border teeth

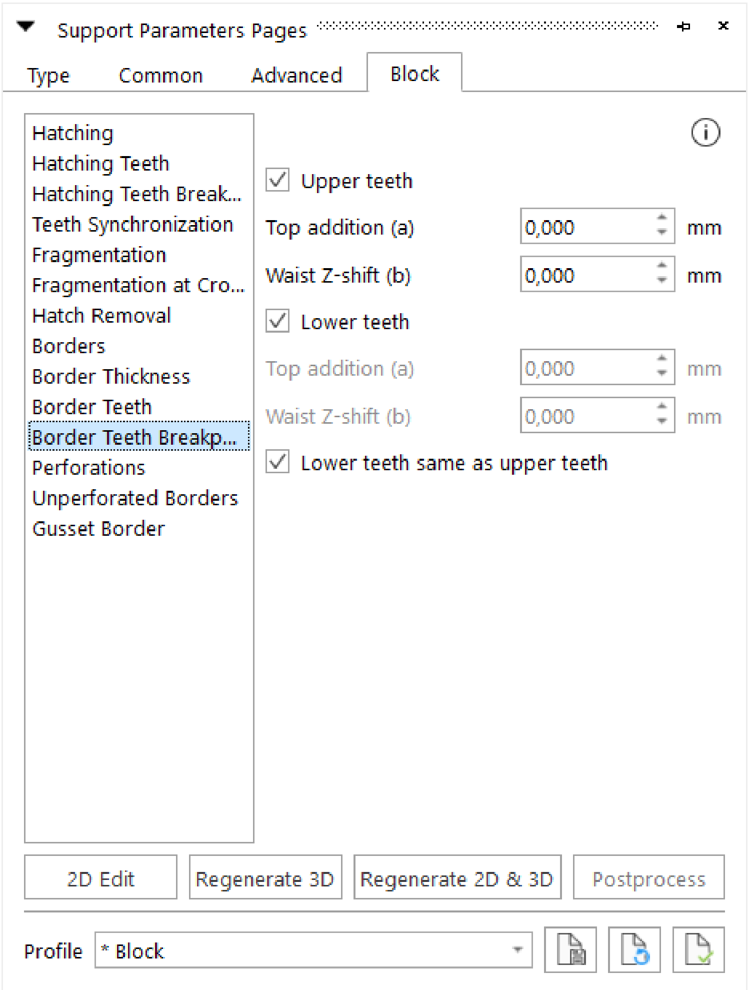


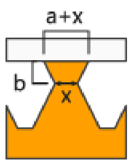




| | | |
|---|---|---|
| Border teeth | In order to remove the supports easily from the part, the hatchings are equipped with teeth profiles on the top and on the bottom. | |
| | Upper | You can specify whether you want Upper Teeth and/or Lower Teeth. Those Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Lower | |
| | Height | |
| | Top Length | |

| | | |
|---|---|---|
| | Base Length<br>Base Interval |  |
| | Lower Teeth Same as Upper Teeth | The Lower Teeth have the same specifications as the Upper Teeth. |
| | Full teeth in ends | You can decide to have a full tooth at the end of a support, instead of half a tooth. |

### 3.7.6.12 Border teeth break point

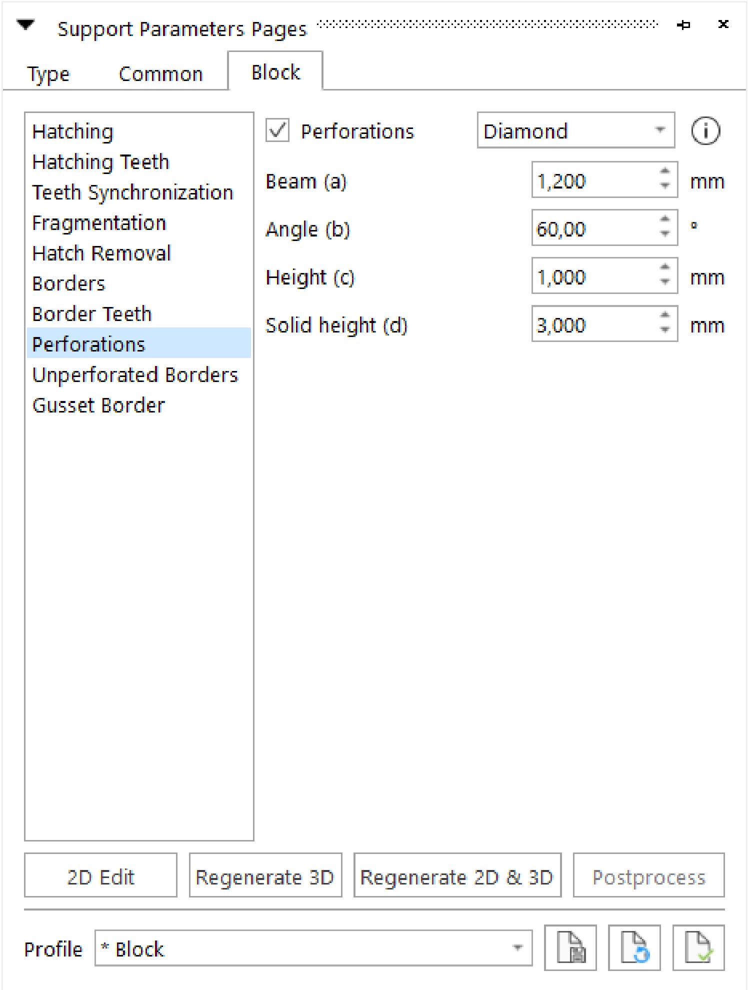


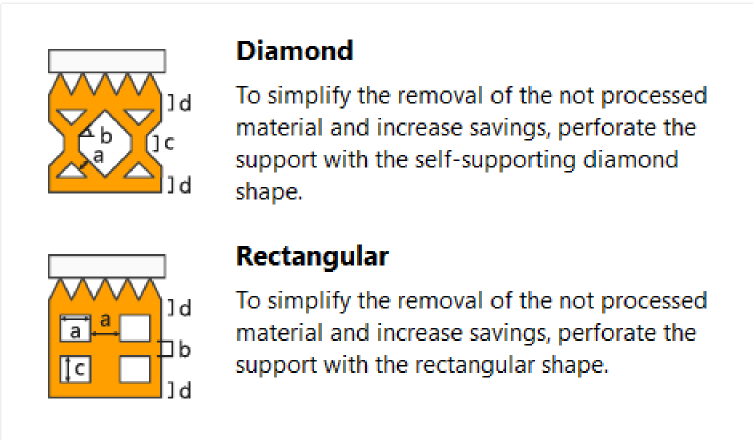



Create breakpoints on teeth to break the support on these points and easily remove it.
Note: X value corresponds to the Top length parameter defined in Teeth page.

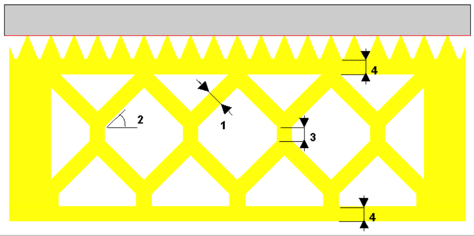
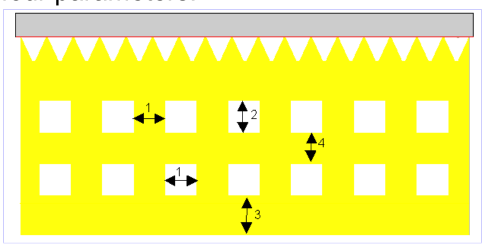
| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

### 3.7.6.13 Perforations



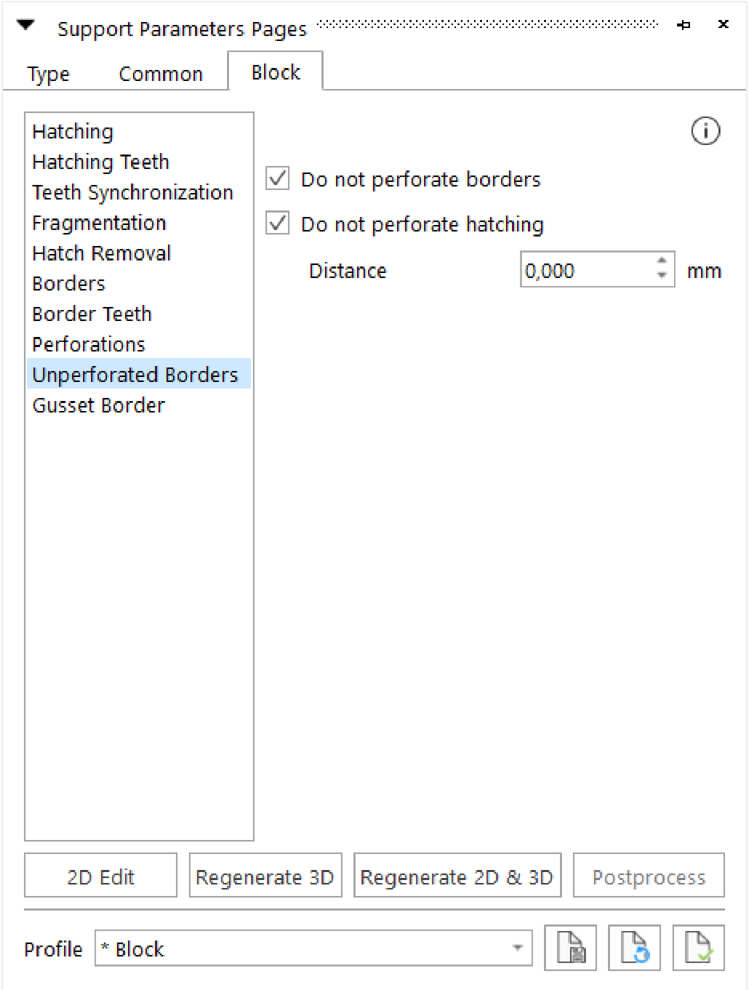



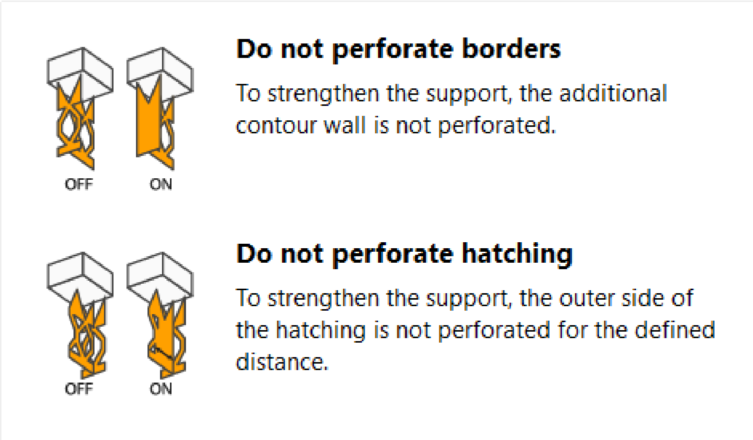

| | |
|---|---|
| Perforations | If this parameter is set, the support will be perforated. There are two possible kinds of perforations: |

| | | | |
|---|---|---|---|
| | Diamond | The shape and the size of the perforations are user defined by setting four parameters:  | |
| | | Beam | The beam thickness (1) defines the thickness of the beams. |
| | | Angle | The perforation angle (2) determines the angle of the perforations |
| | | Height | The height (3) of the vertical part is set with this parameter. |
| | | Solid Height | The separate parameter Solid Height (4) guarantees a good connection to the platform and the part. |
| | Rectangular | The shape and the size of the perforations are user defined by setting four parameters:  | |
| | | Width | The width parameter (1) defines the width of the rectangular holes. |
| | | Height | The Height parameter (2) defines the height of the rectangular holes |
| | | Solid Height | The Solid Height (3) parameter guarantees a good connection to the platform and the part. |
| | | Interval | The interval parameter (4) defines the interval between the holes. |

| | | | |
|---|---|---|---|
| | | Only Perforate … rows | The support will only be perforated for the given rows, starting from the bottom. This enables the drainage of resin for stable supports. |
| | | Extend Hatchings | The hatchings of the support are extended outside the border of the surface. |

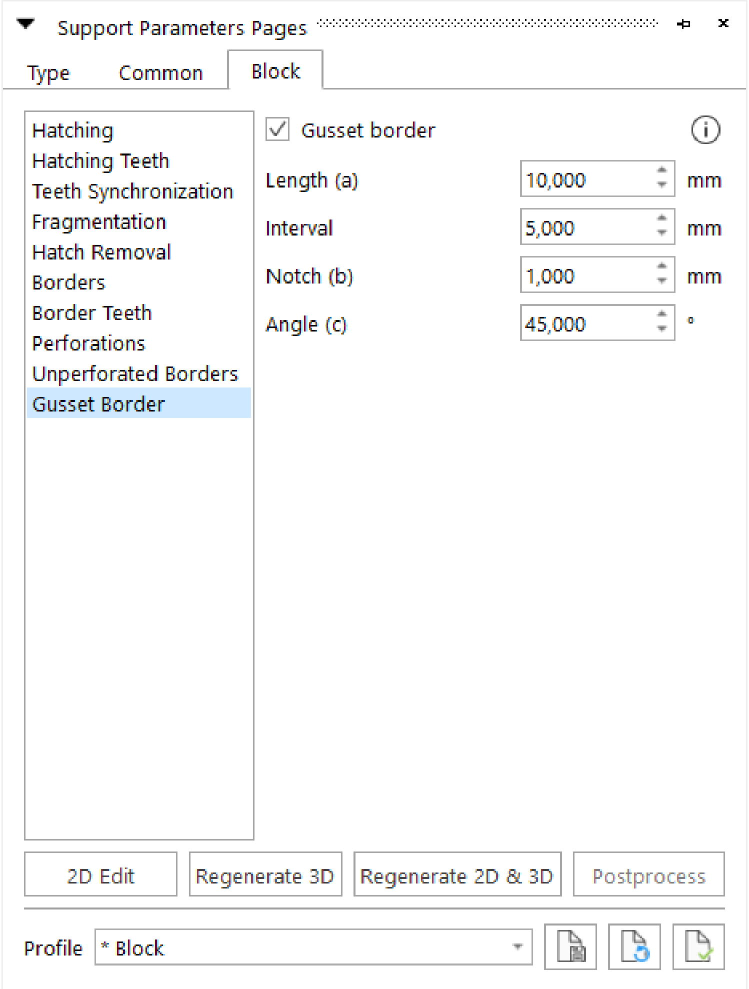
### *3.7.6.14 Unperforated borders*

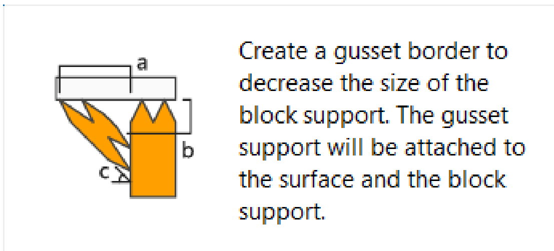


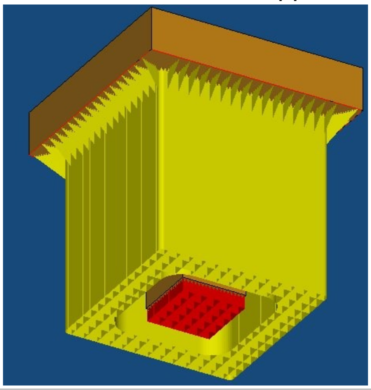



| | | |
|---|---|---|
| Unperforated borders | Do Not Perforate Borders | The additional contour walls will not be perforated. This makes the support stronger. |
| | Do Not Perforate Hatching for | The hatchings will not be perforated for the given distance, measured from the border to the inside. Again, this will reinforce the support. |

### 3.7.6.15 Gusset border

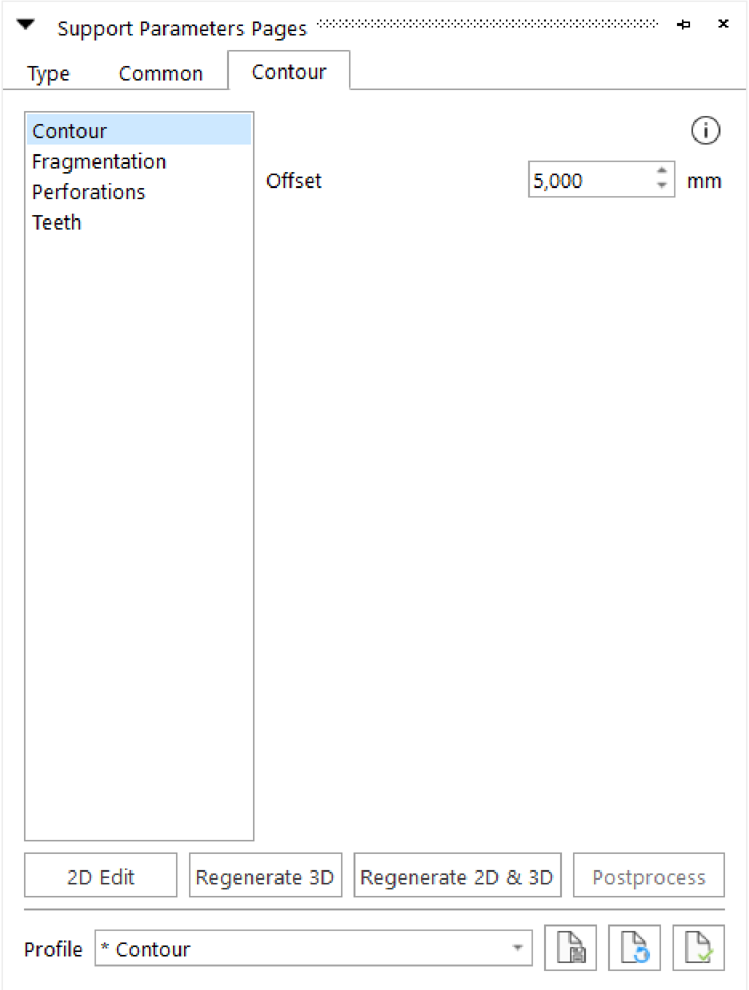


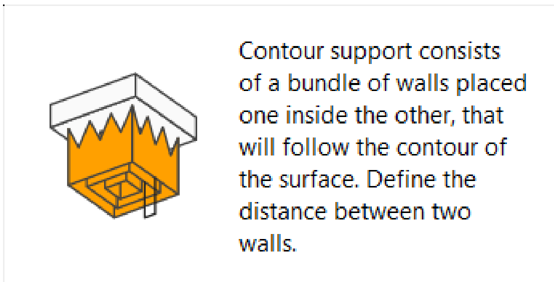



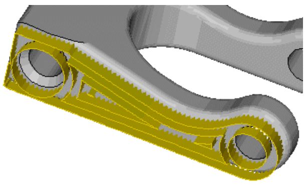
| | | |
|---|---|---|
| Gusset Border | Gussets can be attached to block support.<br> | |
| | Length | The length of the gusset is the length of the rib attached to the part. |
| | Interval | The interval determines the distance between the gussets. |
| | Notch | The notch parameter indicates how much the gusset is extracted from the corner. |
| | Angle | The gusset angle, the angle between the overhang and the free border of the gusset, can be determined. |

## 3.7.7 Contour

### *3.7.7.1 Contour*

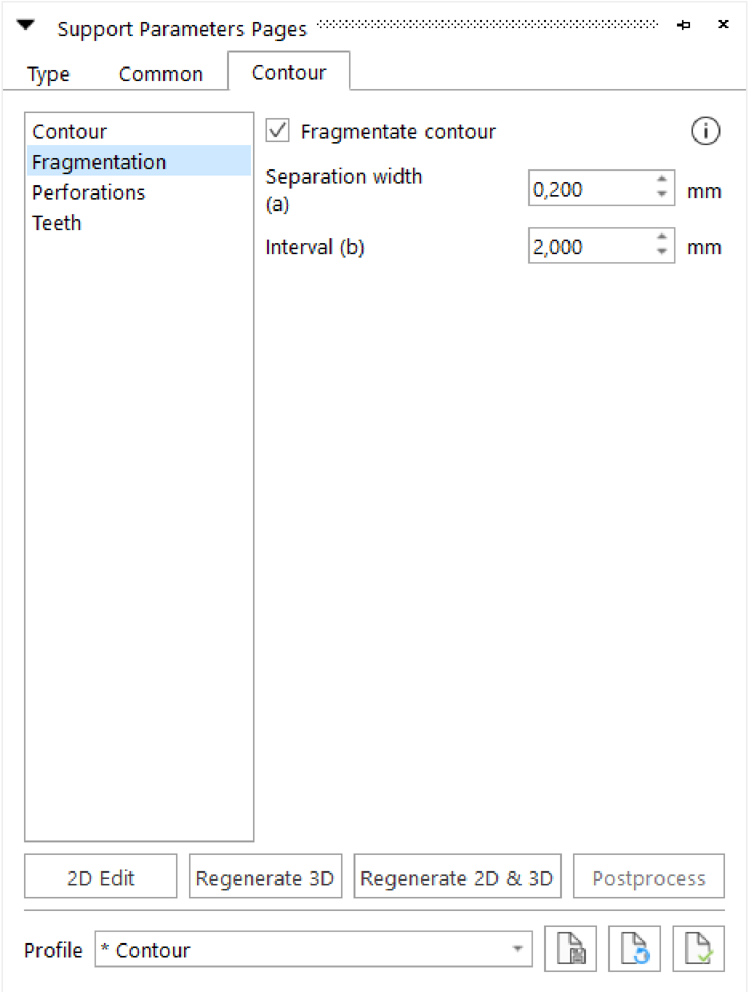


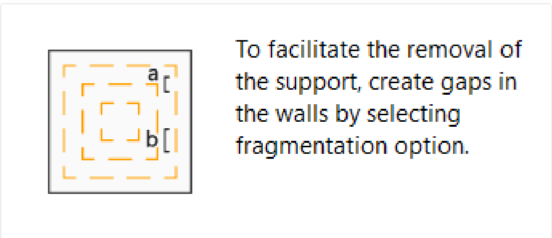



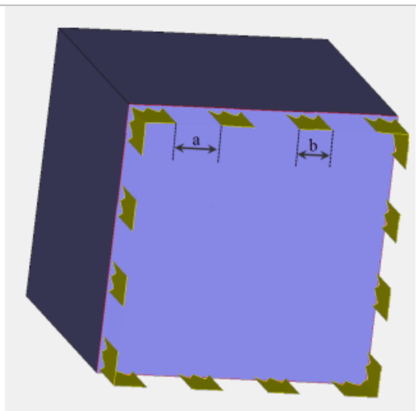

| | |
|---|---|
| Contour | Contour Supports have no internal hatching, only a few contours have an offset to each other.  |

| | | |
|---|---|---|
| | Contour Offset | The Contour Offsets are the offset from one contour to the other. |

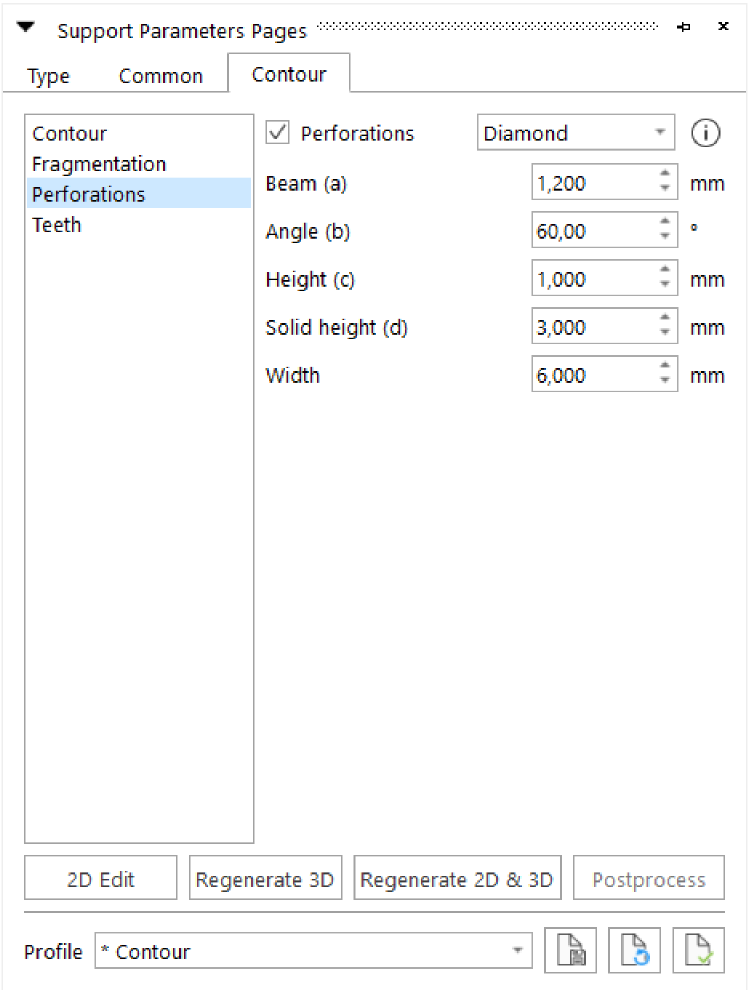
### 3.7.7.2 Fragmentation

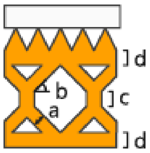


| | | |
|---|---|---|
| Fragmentate | Select Fragmentation to create gaps in the support |  |
| | Separation width (a) | Gaps width |
| | Interval (b) | Distance between the end of a gap and the starting of the next one |

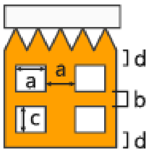
### 3.7.7.3 *Perforations*





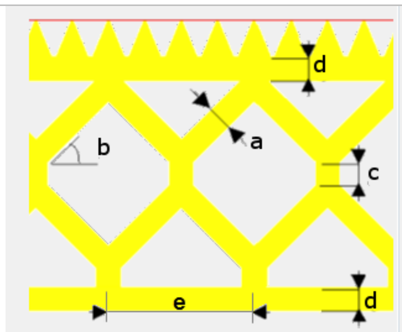
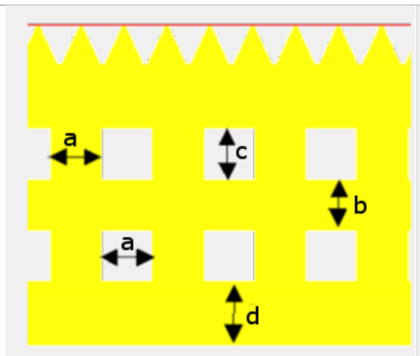

**Diamond**

To simplify the removal of the not processed material and increase savings, perforate the support with the self-supporting diamond shape.



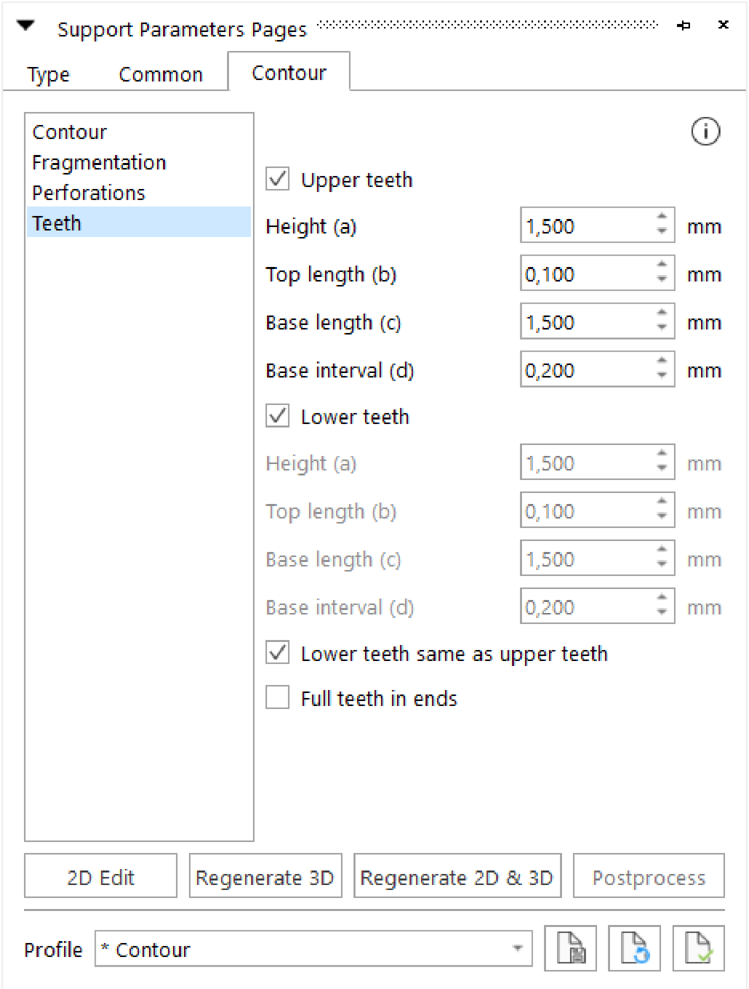

**Rectangular**

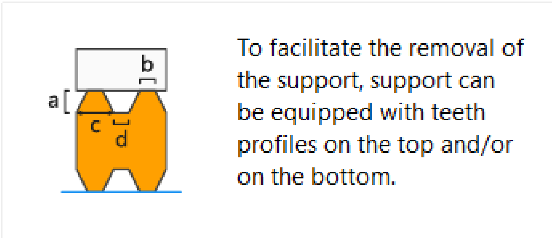
To simplify the removal of the not processed material and increase savings, perforate the support with the rectangular shape.

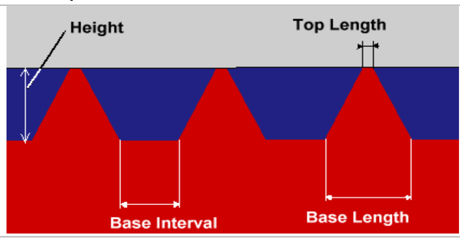
| Perforations | | |
|---|---|---|
| Diamond | The shape and the size of the perforations are user defined by setting four parameters: |  |
| | Beam (a) | The beam thickness defines the thickness of the beams. |
| | Angle (b) | The perforation angle determines the angle of the perforations |
| | Height (c) | The height of the vertical part is set with this parameter. |
| | Solid Height (d) | The separate parameter Solid Height guarantees a good connection to the platform and the part. |
| | Width (e) | The diamond width is defined by this parameter |
| Rectangular | |  |
| | Width (a) | The width parameter defines the width of the rectangular holes. |

| | | |
|---|---|---|
| | Interval (b) | The interval parameter defines the interval between the holes. |
| | Height (c) | The Height parameter defines the height of the rectangular holes |
| | Solid Height (d) | The Solid Height parameter guarantees a good connection to the platform and the part. |
| | Only perforate | The support will only be perforated for the given rows, starting from the bottom. This enables the drainage of resin for stable supports. |

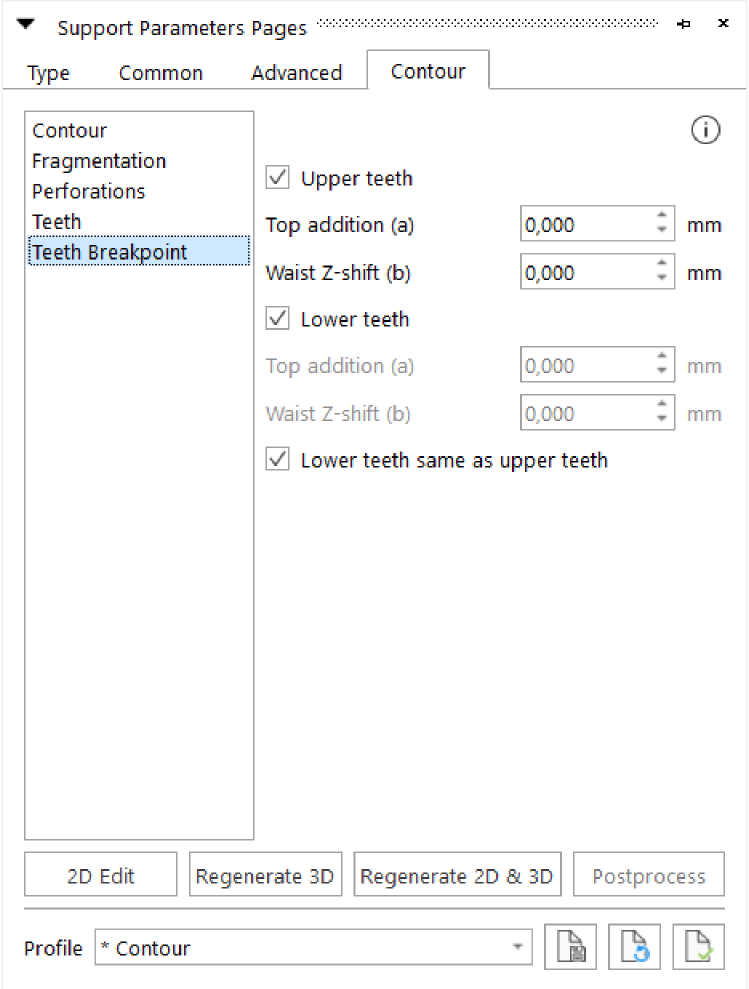
### *3.7.7.4 Teeth*

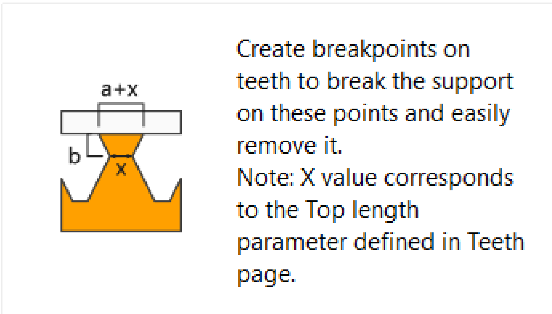





| | | |
|---|---|---|
| Teeth | In order to remove the supports easily from the part, contours are equipped with teeth profiles on the top and on the bottom. | |
| | Upper | You can specify whether you want Upper Teeth and/or Lower Teeth. Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Lower | |
| | Height |  |
| | Top Length | |
| | Base Length | |
| | Base Interval | |
| | Lower Teeth Same as Upper Teeth | The Lower Teeth have the same specifications as the Upper Teeth. |
| | Full Teeth in ends | You can decide to have a full tooth at the end of a support, instead of half a tooth. |
| | Copy current parameters to all teeth | Copy the teeth parameters from this support type to all types which are using teeth. |

### 3.7.7.5 Teeth breakpoint



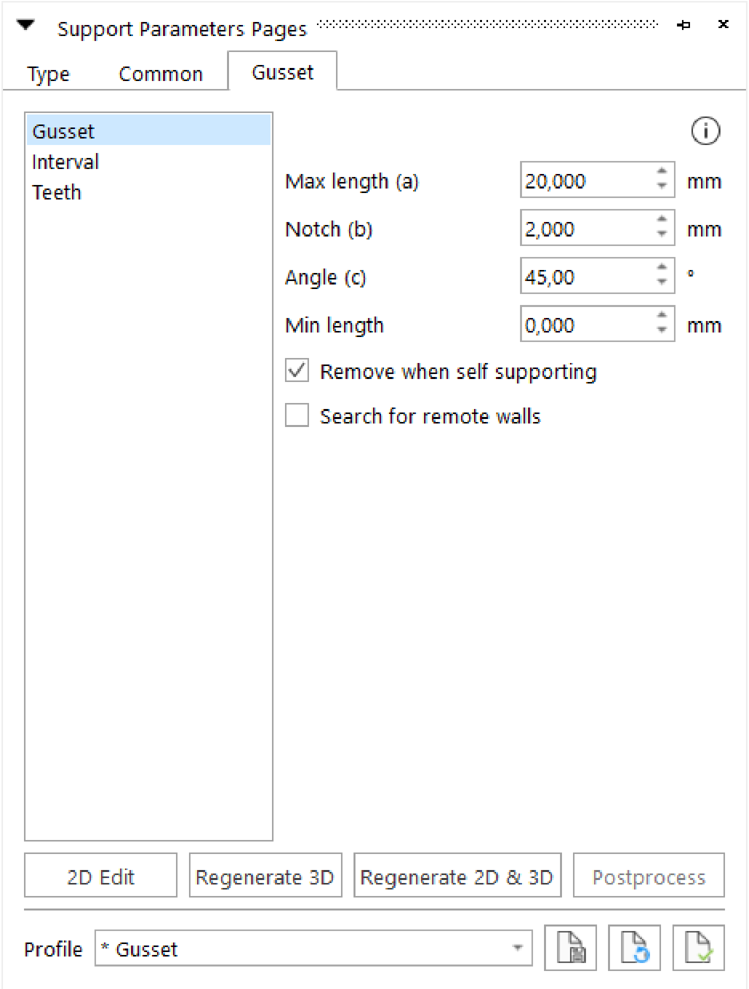



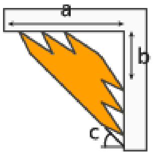

| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |

| | | |
|---|---|---|
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

## 3.7.8 Gusset

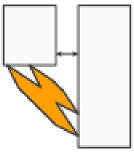
### *3.7.8.1 Gusset*





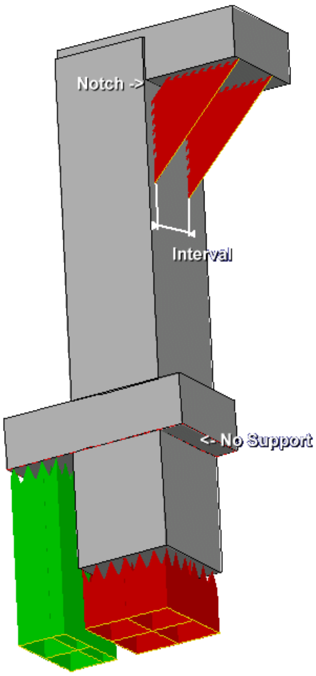

**Gusset**

Gusset support can be used for overhangs, because it supports the surface on a sidewall instead of on to the platform. A minimum size of the overhang surface to generate a gusset support can also be defined.

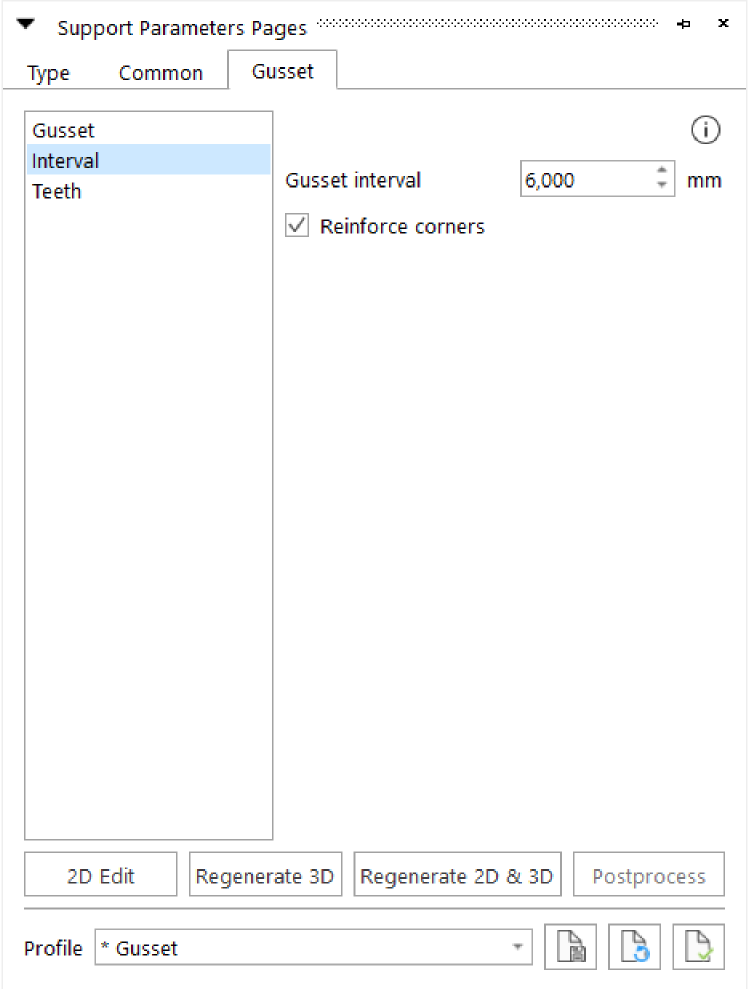


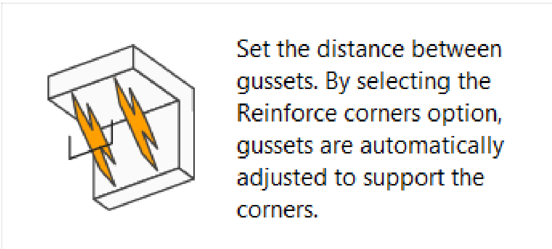
**Search for remote walls**

Create gusset support between a surface and a wall that are not directly connected.
Gusset support will be generated if distance from supporting wall to the end of supported wall is smaller than the defined value.

<table>
<tr><td rowspan="5">Gussets<br></td><td colspan="2">Gusset supports are used to support overhangs which are large enough to have support, but not too large so that a Block Support is not needed. Gussets will support on a sidewall instead of on the platform or a lower surface.</td></tr>
<tr><td>Maximal Length</td><td>The length of the gussets is the length of the rib attached to the part.</td></tr>
<tr><td>Minimal Length</td><td>If the overhang is smaller than the minimal length, support isn't necessary.</td></tr>
<tr><td>Remove when Self Supporting</td><td>The gusset support will be removed when the overhang is self-supporting.</td></tr>
<tr><td>Notch</td><td>The notch parameter indicates how much the gusset is extracted from the corner.</td></tr>
<tr><td></td><td>Angle</td><td>The gusset angle, the angle between the overhang and the free border of the gusset, can be determined.</td></tr>
</table>

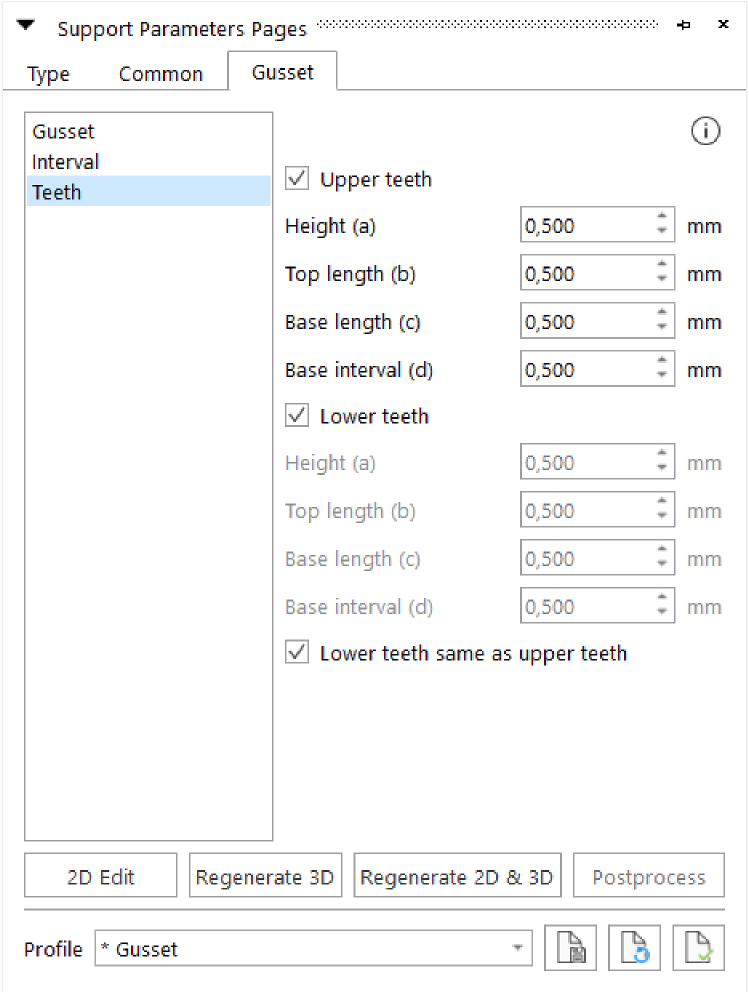
### 3.7.8.2 Interval

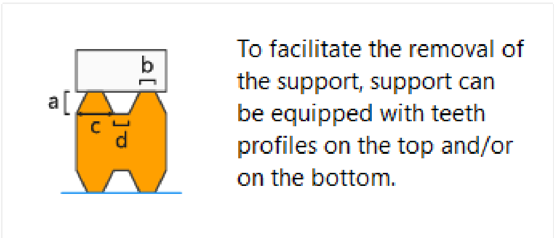


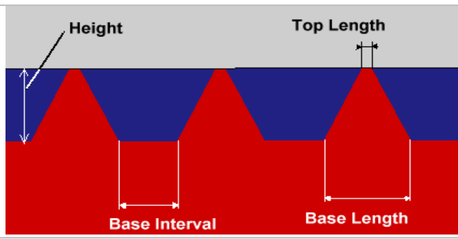

<table>
<tr><td rowspan="2">Interval</td><td colspan="2">The interval determines the distance between gussets.</td></tr>
<tr><td>Reinforce corners</td><td>You can decide to reinforce the corners of a gusset support.</td></tr>
</table>

### *3.7.8.3 Teeth*

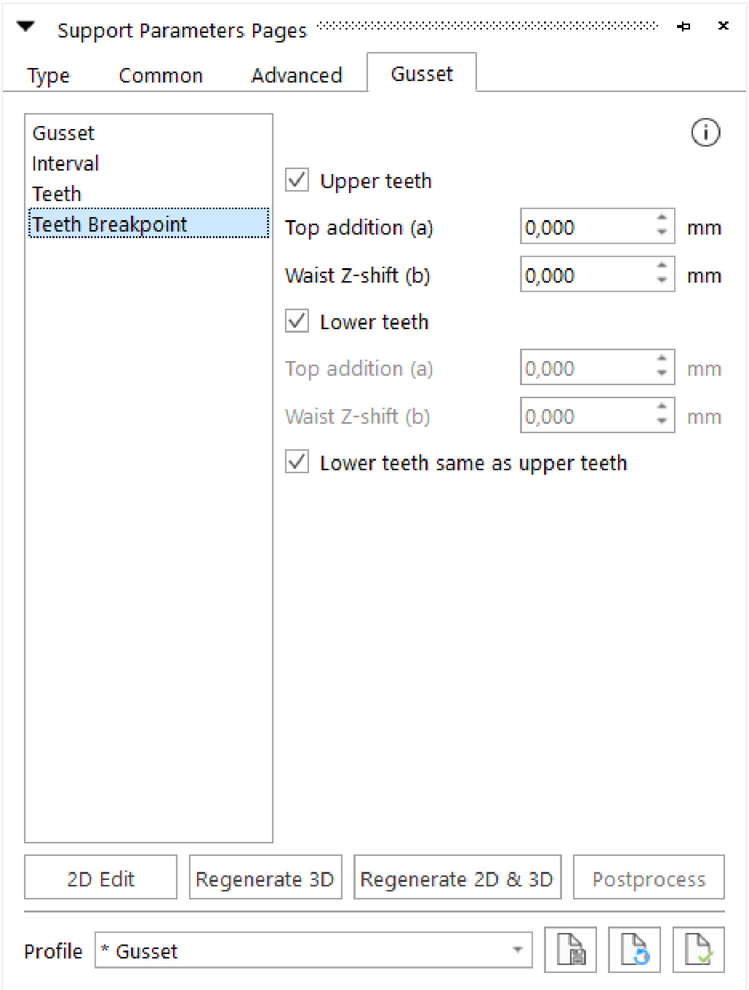


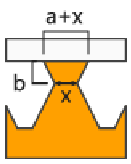




| | | |
|---|---|---|
| Teeth | In order to remove the supports easily from the part, contours are equipped with teeth profiles on the top and on the bottom. | |
| | Upper | You can specify whether you want Upper Teeth and/or Lower Teeth. Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Lower | |

| | | |
|---|---|---|
| | Height |  |
| | Top Length | |
| | Base Length | |
| | Base Interval | |
| | Lower Teeth Same as Upper Teeth | The Lower Teeth have the same specifications as the Upper Teeth. |
| | Full teeth in ends | You can decide to have a full tooth at the end of a support, instead of half a tooth. |

### 3.7.8.4 Teeth breakpoint



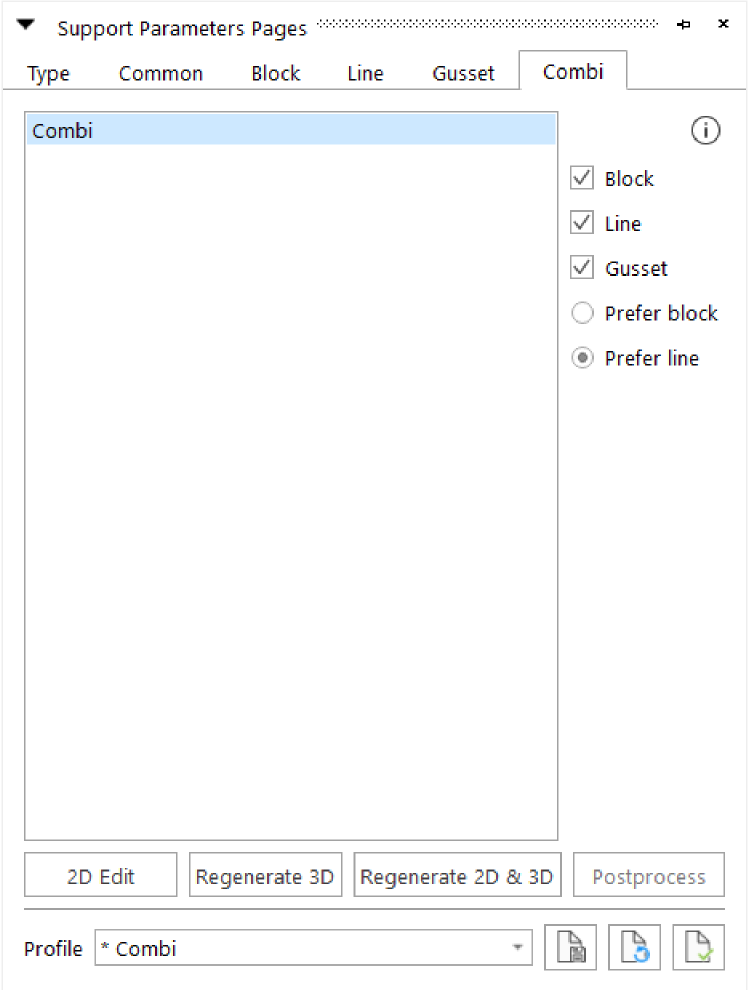


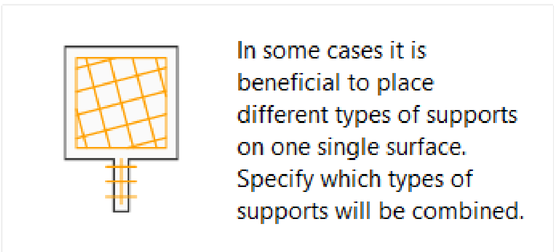

Create breakpoints on teeth to break the support on these points and easily remove it.
Note: X value corresponds to the Top length parameter defined in Teeth page.

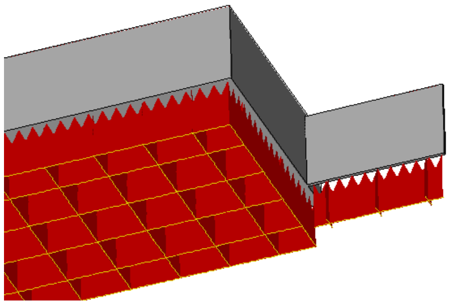
| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

## 3.7.9 Combi

### *3.7.9.1 Combi*



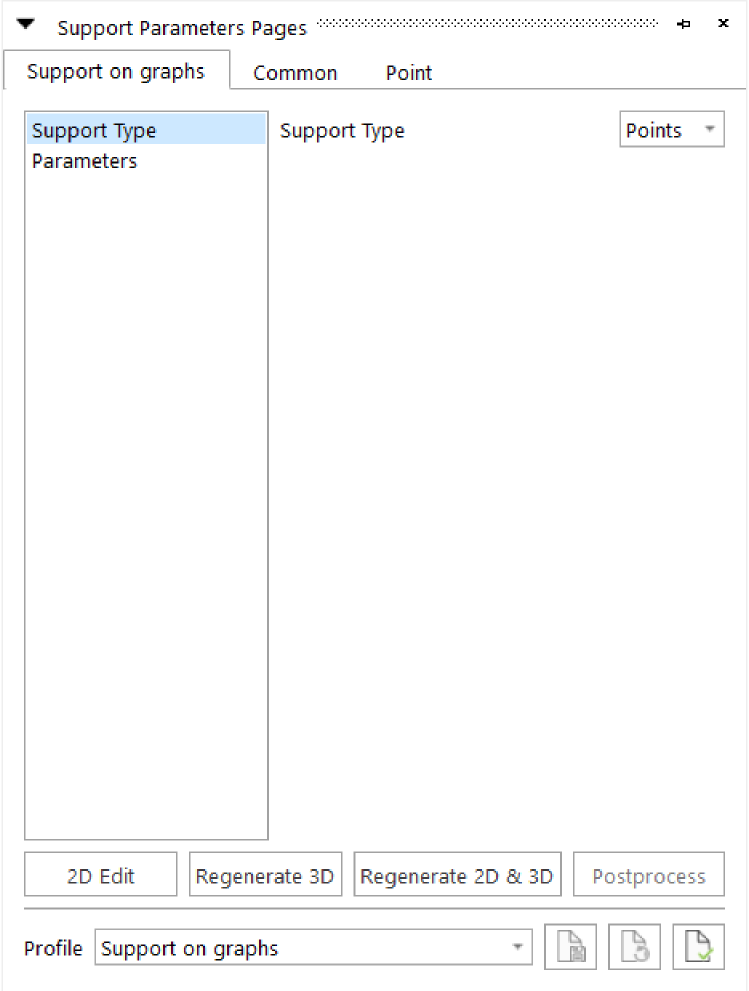
<table>
<tr><td rowspan="6">Combi</td><td colspan="2">In some cases it is beneficial to place different types of supports on one single surface. In the figure, there is a line and a block support on one surface. You need a Block Support to support the big structure, but a Block Support is too strong for the fine detail. Magics will generate a Combi support, a combination of a Block and a Line support.<br></td></tr>
<tr><td>Block</td><td rowspan="3">You can specify which types of supports will be combined. In the support generation mode you can also alter the parameters of the different support types. The default values are taken from the respective base support types.</td></tr>
<tr><td>Line</td></tr>
<tr><td>Gusset</td></tr>
<tr><td>Prefer Block</td><td rowspan="2">It can be selected which support is preferred: block or line support.</td></tr>
<tr><td>Prefer Line</td></tr>
</table>

### 3.7.10 Support on graphs

This feature is only available in combination with the Magics Lightweight Structures license.

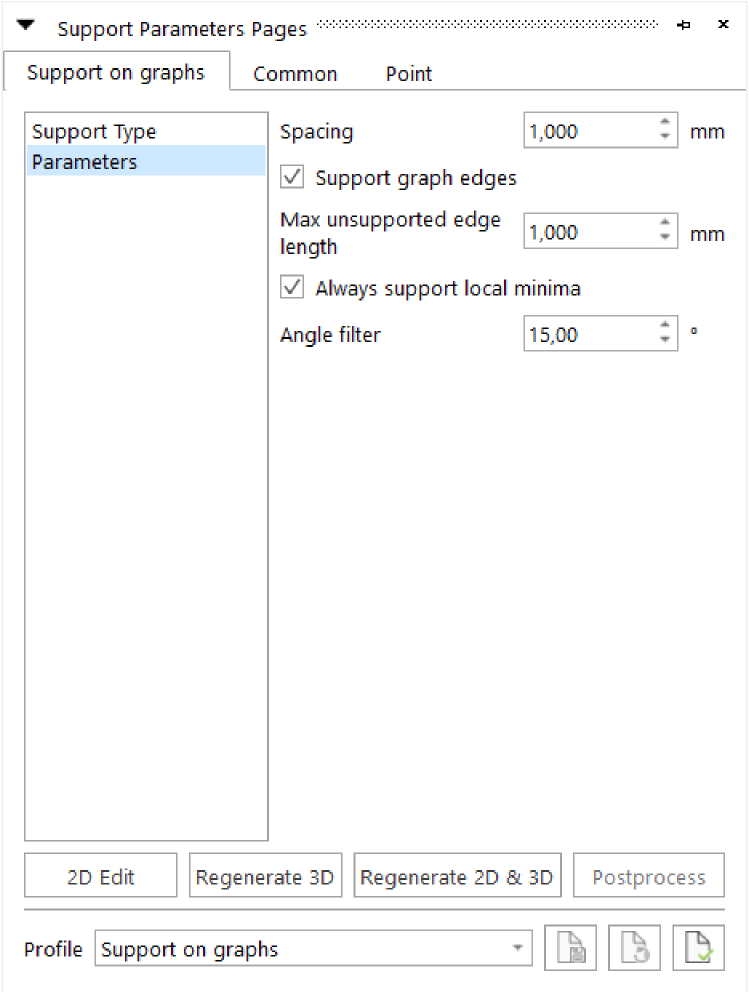
Supports will be automatically generated on graphs coming from 3-matic. All connected graphs will be treated as one support ID in the support list.

### 3.7.10.1 Support types




| | |
|---|---|
| Support type | You can use points or cones to support the graphs. |

### *3.7.10.2 Parameters*




| | | |
|---|---|---|
| Parameters | Spacing | This will be the minimum clearance between supports. |
| | Support on graph edges | When the checkbox is deselected, only the endpoints of graphs will be considered as points that need support. When it is selected, intermediate support points will be created. |
| | Max unsupported edge length | Is used to determine if and how many intermediate support points will be created on a graph. |
| | Always support local minima | Local minima will always be supported independently of the spacing parameter. |

| | | |
|---|---|---|
| | Angle filter | Support is only wanted on the outer side of the structure. The angle filter is used to determine whether a point can be considered as internal.<br>From every point, we draw a cone like shape (depending on the angle filter) down and see if this is intersecting with the structure. When it is intersecting we filter it out from the set of points that need support. |

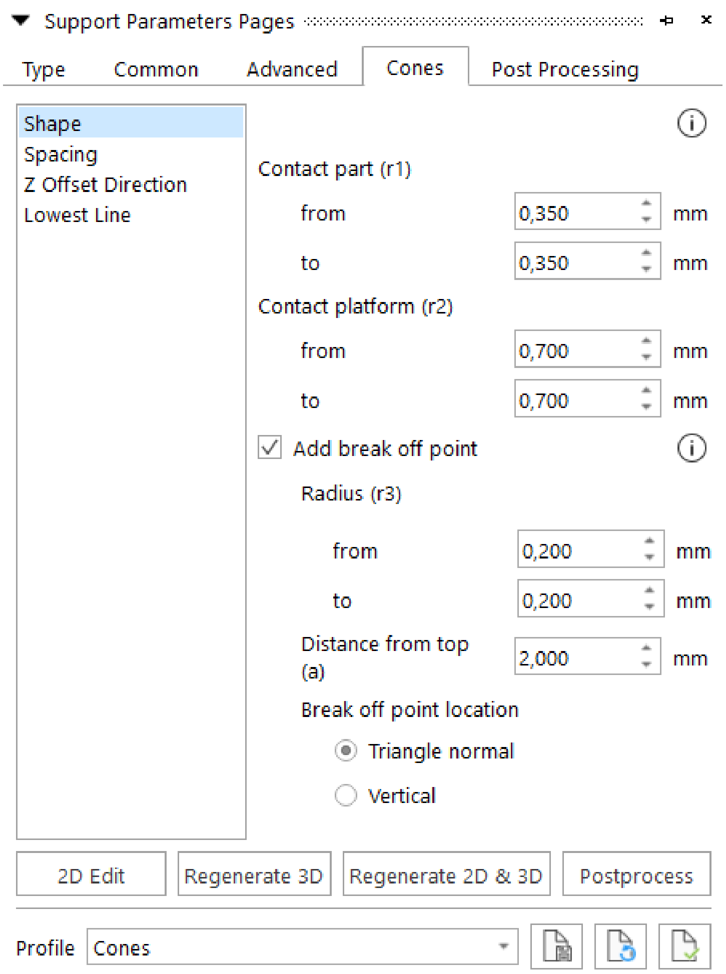
### 3.7.11 Volume

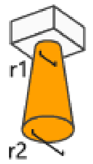
More information on the other parameters can be found within the 'Volume Support' module.

— See Volume Support Generation Parameters, page 712

### 3.7.12 Cones

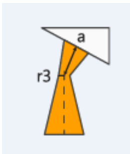
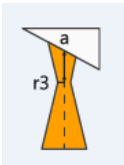
#### *3.7.12.1 Shape*



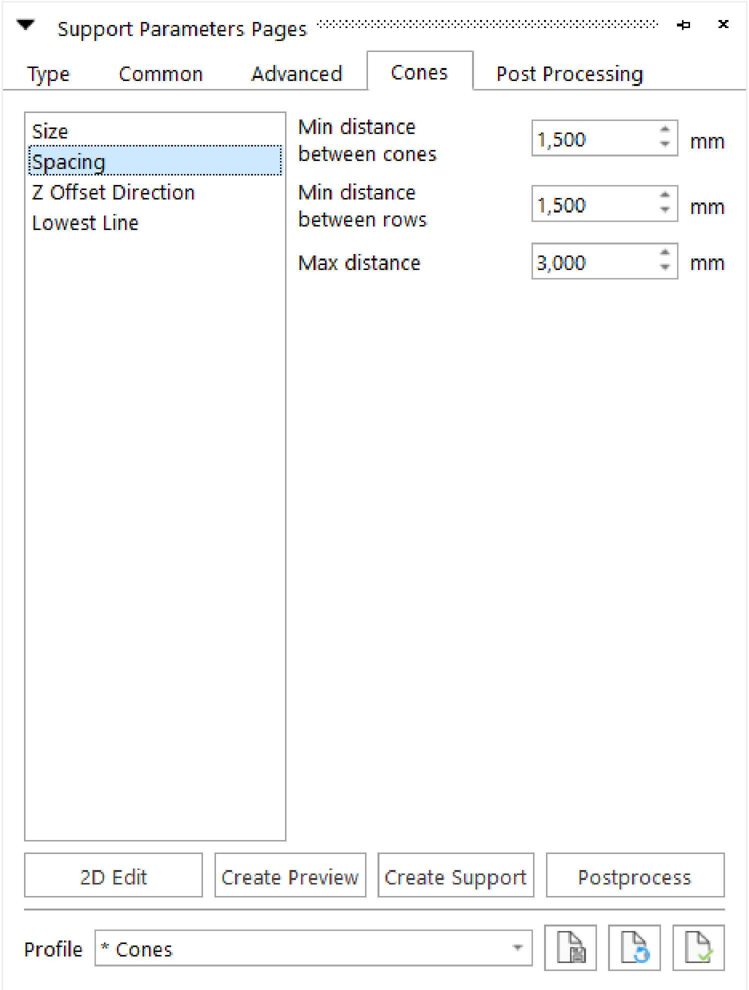



Define the part contact radius and the platform contact radius of the cone. Cones are automatically generated inside the defined intervals.

| | | |
|---|---|---|
| Shape | Contact part (r1) | Size of the cone at the part |
| | Contact platform (r2) | Size of the cone at the platform |

| | | |
|---|---|---|
| Add break off point | Add break off point at the extremity of your cone in contact with the part | |
| | Radius (r3) | Break off point diameter |
| | Distance from top (a) | Distance between your break off point and the part |
| Break off point location | Triangle normal   | Break off point will be generated following the triangle's normal direction |
| | Vertical   | Break off point will be generated vertically |

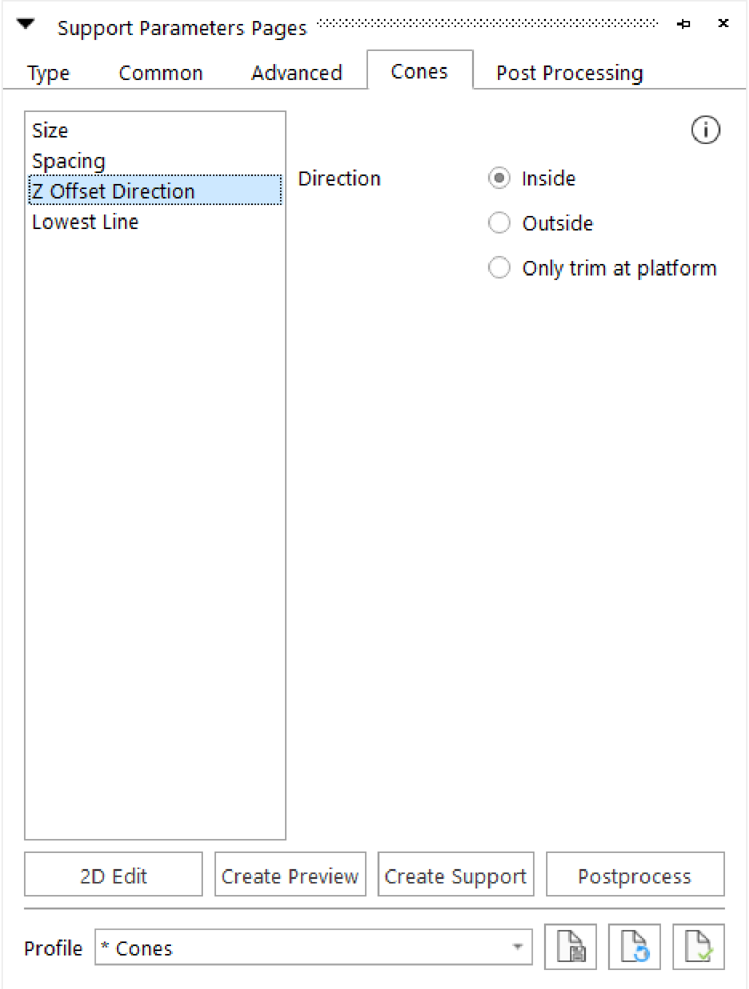
### 3.7.12.2 Spacing

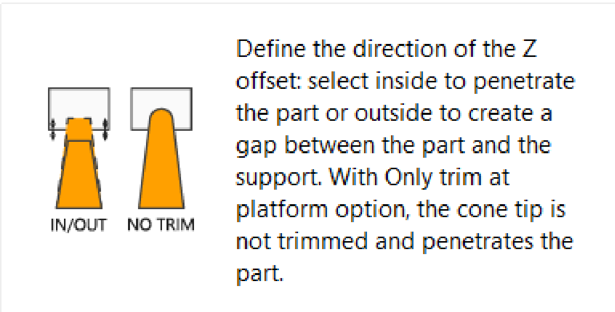



| | | |
|---|---|---|
| Spacing | *The cones will be placed in grid determined by following parameters* | |
| | Min distance between cones | Space between cones |
| | Min distance between rows | Space between the rows |
| | Max distance between cones | Maximum distance between cones. |

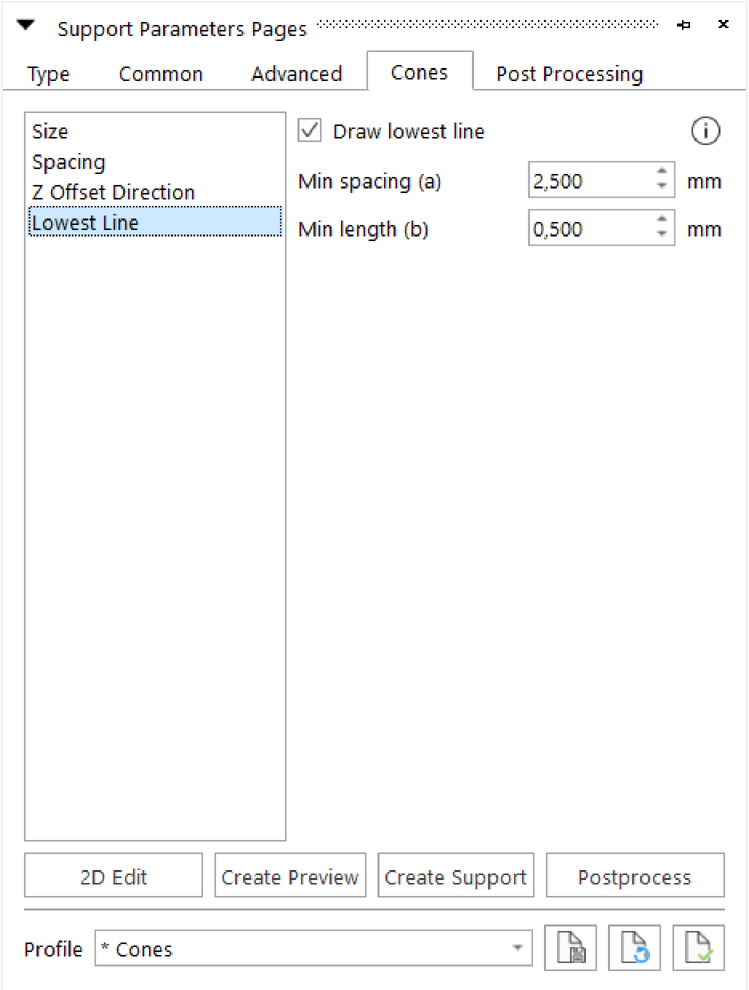
Furthermore the algorithm takes into account ‘XY Offset’ and ‘Z Offsets’ of the Common page.

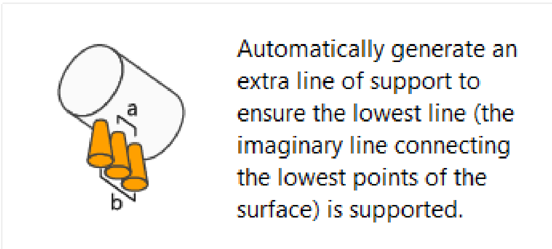
### 3.7.12.3 Z Offset Direction



### *3.7.12.4 Lowest Line*



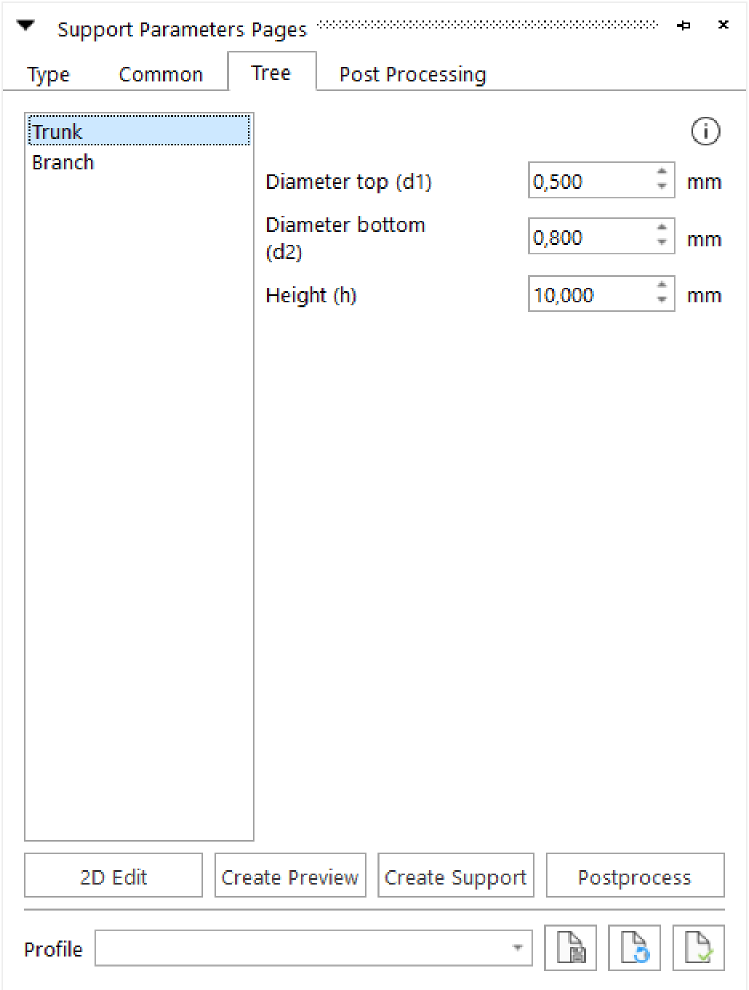



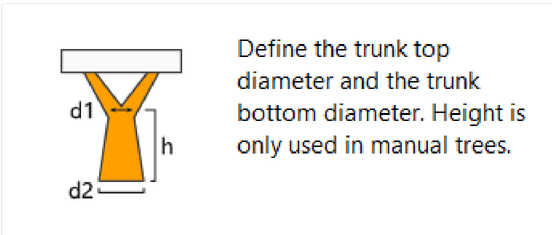

| | | |
|---|---|---|
| Draw lowest line | When placing a support under a curved surface, it can happen that the lowest line (= the imaginary line connecting the lowest points of the surface) is not supported correctly. This can cause problems when building the part with some RP-techniques. When lowest line is checked, an extra line of support will be placed so that this lowest line is correctly supported. | |
| | Minimal spacing | Defines the minimal spacing between the cone centers along the lowest line. |

| | | |
|---|---|---|
| | Minimum length | Lowest lines smaller then this value (length) will be filtered out |

## 3.7.13 Tree

### *3.7.13.1 Trunk*

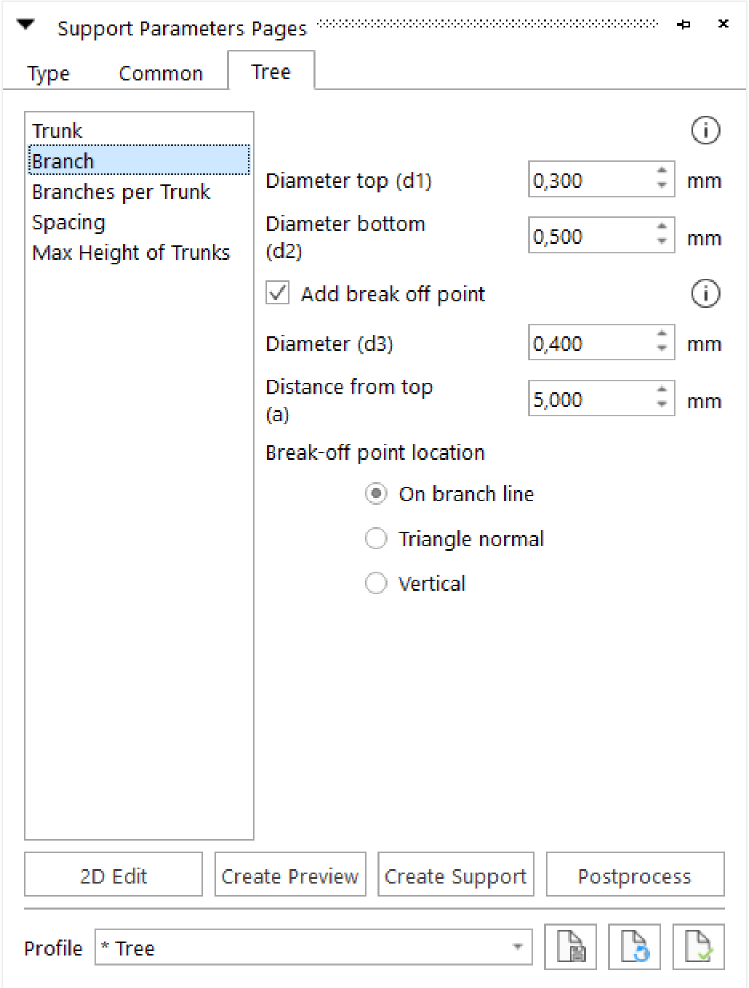


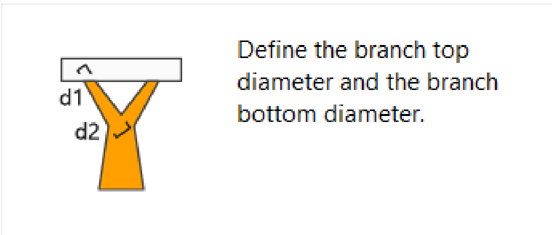




| | |
|---|---|
| Trunk | Defines tree support trunk parameters |
| Diameter top (d1) | Diameter of the trunk at the top |

| | |
|---|---|
| Diameter bottom (d2) | Diameter of the trunk at the bottom |
| Height (h) | Height of your trunk |

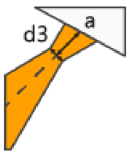
### 3.7.13.2 Branch



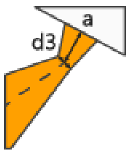

| | |
|---|---|
| Branch | Defines tree support branch parameters |
| Diameter top (d1) | Diameter of the branch at the top (where connected to the part) |

| | |
|---|---|
| Diameter bottom (d2) | Diameter of the branch at the bottom (where connected to the trunk) |



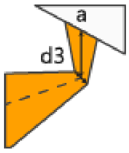

**On branch line**

To facilitate the support removal, add a break off point where the branch connects to the part. With On branch line option, the break off point follows the same line that connects the branch to the part.



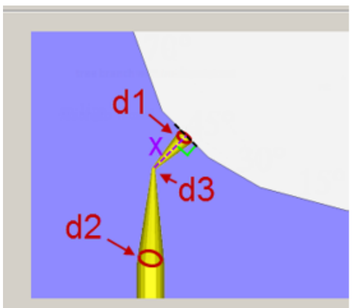

**Triangle normal**

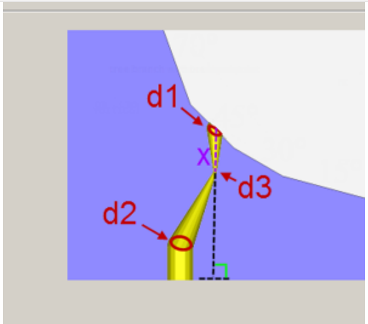
With Triangle normal option, the break off point follows the direction of the part triangle normal.



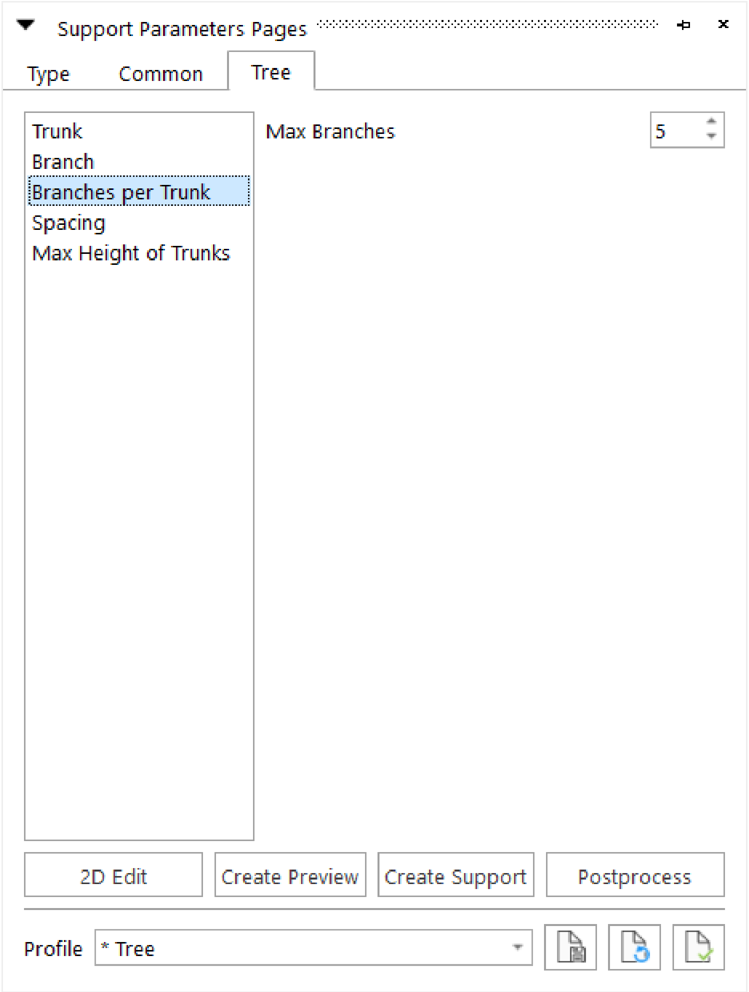

**Vertical**

With Vertical option, the break off point follows the Z direction.

| | | |
|---|---|---|
| Add break-off point | Add break off point at the extremity of your branch in contact with the part | |
| | Diameter (d3) | Break off point diameter |
| | Distance from top (x) | Distance between your break off point and the part |
| Break-off point location | On branch line | Break off point will be generated on the same line connecting branch to the part |
| | Triangle normal   | Break off point will be generated following the triangle’s normal direction |
| | Vertical | Break off point will be generated vertically |

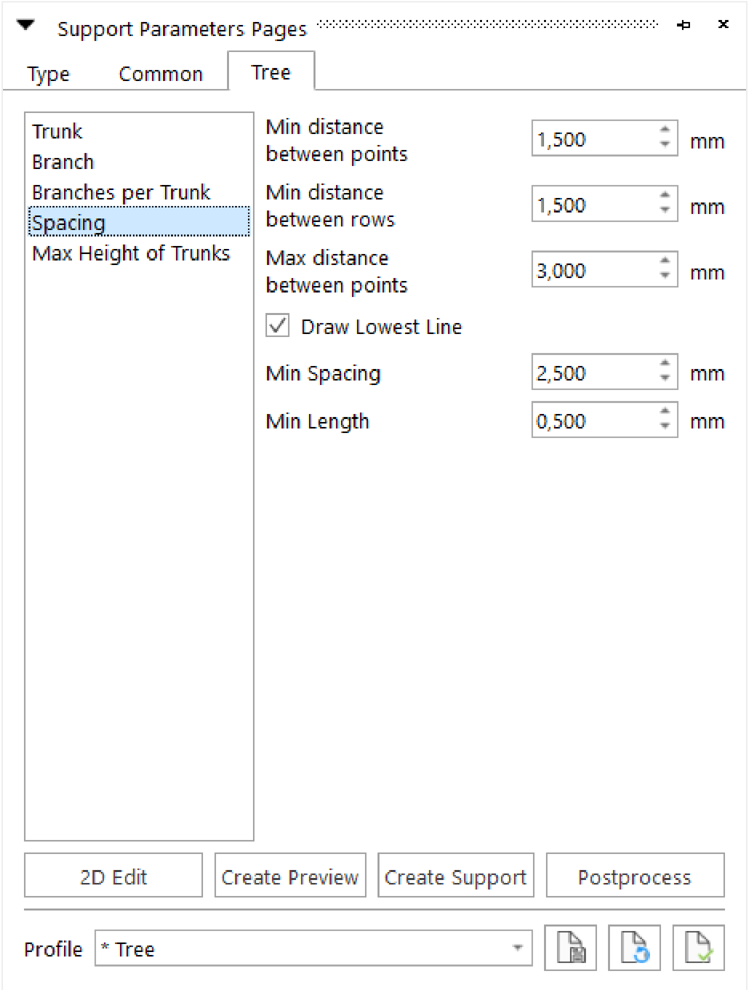



### 3.7.13.3 Branches per Trunk




| | |
|---|---|
| Max branches per trunk | Defines the maximum amount of branches that can be created per trunk |

### 3.7.13.4 Spacing

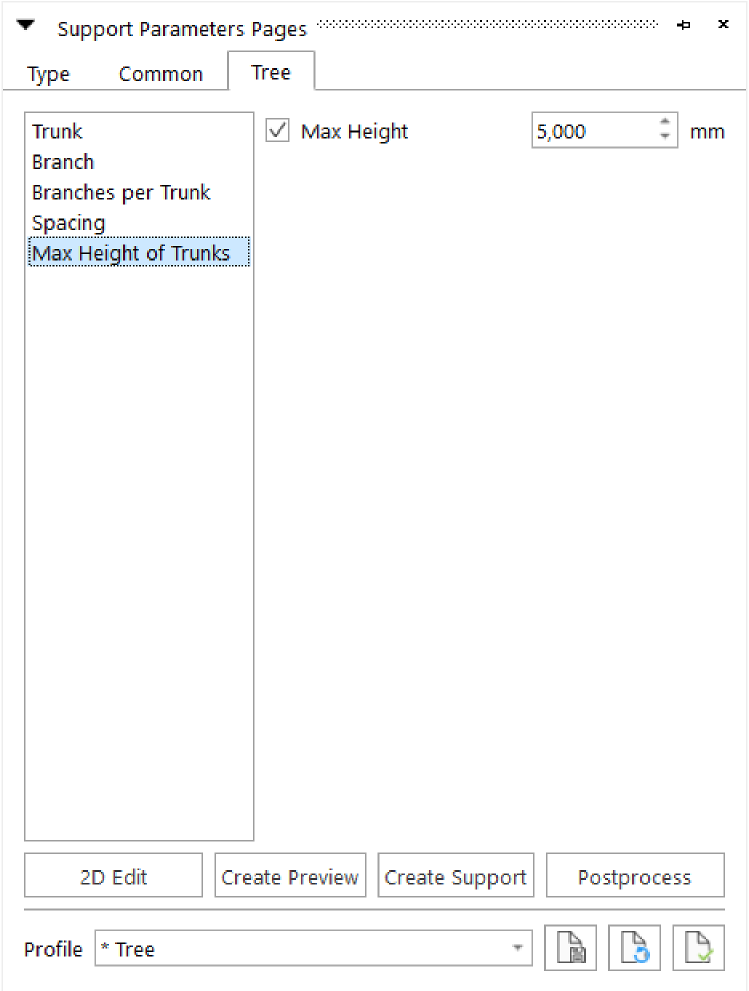



These are the same parameters as used in cone supports.

| | |
|---|---|
| Min distance between connection points | Space between connection points |
| Min distance between rows | Space between rows of connection points |
| Max distance between connection points | The maximum space between connection points |
| Draw Lowest Line | When placing a support under a curved surface, it can happen that the lowest line (= the imaginary line connecting the lowest points of the surface) is not supported correctly. This can cause problems when building the part with some RP-techniques. When lowest line is checked, an extra line of support will be placed so that this lowest line is correctly supported. |
| Minimal spacing (a) | Defines the minimal spacing between the connection points along the lowest line. |

| | |
|---|---|
| Minimum length | Lowest lines smaller then this value (length) will be filtered out |

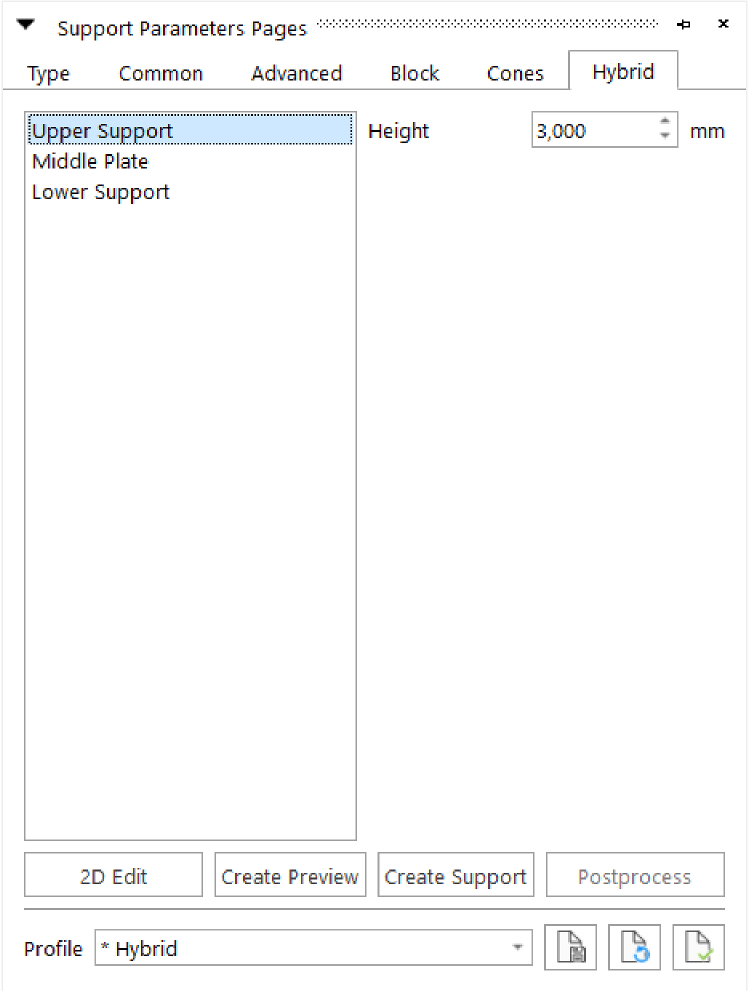
### 3.7.13.5 Max Height of Trunk




| | |
|---|---|
| Max height of trunks | If checked, the maximum height of trunks will be limited by the entered value. |

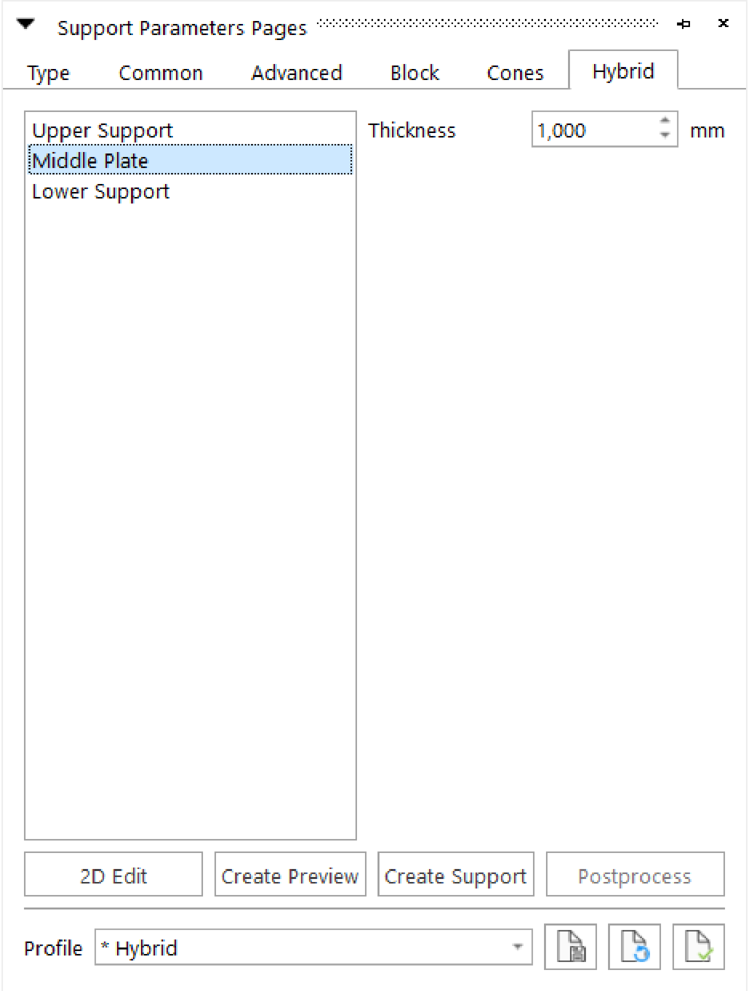
## 3.7.14 Hybrid

### *3.7.14.1 Upper support*



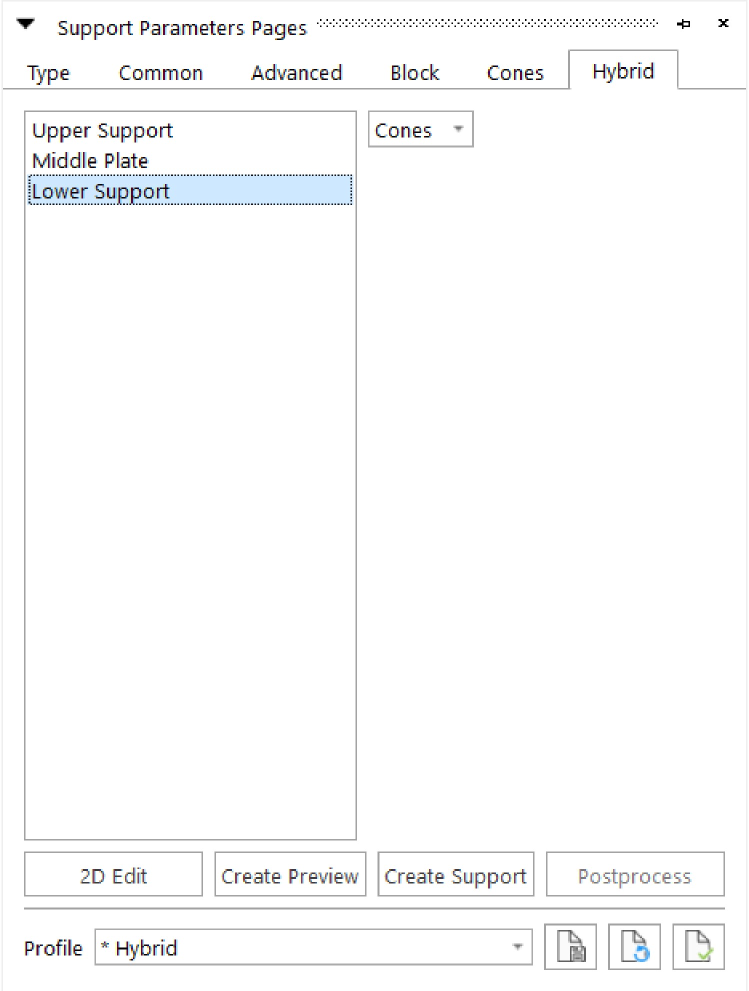

| | |
|---|---|
| Upper support height | Defines the height of the upper part of the hybrid support structure |

### 3.7.14.2 Middle plate




| | |
|---|---|
| Middle plate thickness | Defines the height of the middle part of the hybrid support structure |

### 3.7.14.3 Lower support




| | |
|---|---|
| Cones | The lower part of the support structure consists of cones |
| Trees | The lower part of the support structure consists of trees |

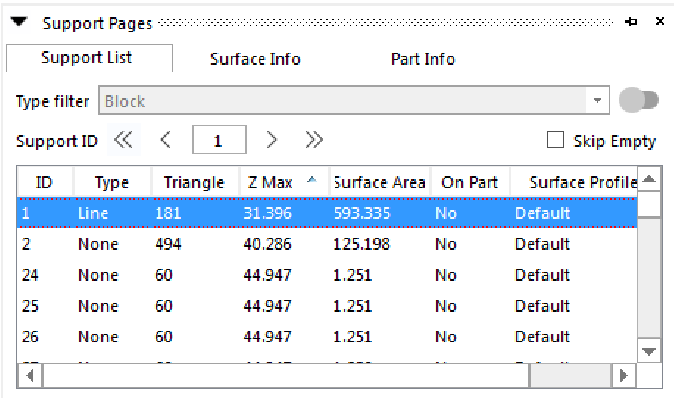
## 3.8 Modifying Surfaces

### 3.8.1 Support Types & Parameters

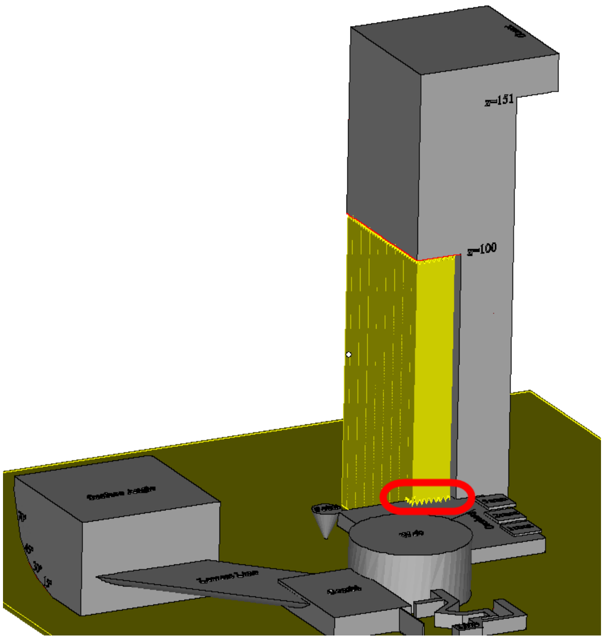
Magics will propose support structures based on the selection and construction parameters you have set in the Machine properties. In the support mode, you can change the proposed support type on a downfacing surface, for example from a line support to a block support. You can also adapt the support parameters of an individual support structure, for example lower the hatch distance of a block support.

### 3.8.2 Support List page

The support list gives you an overview of all surfaces created with their support type. It is also possible to enable a filter for the support list to only visualize supports per type.



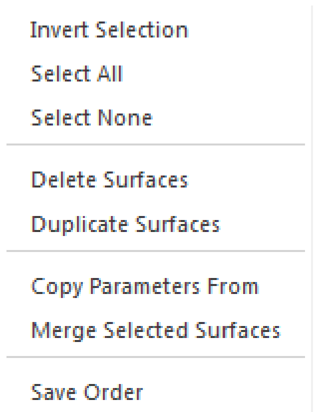

The red items in the list indicate that the support touches a lower surface of the part itself.

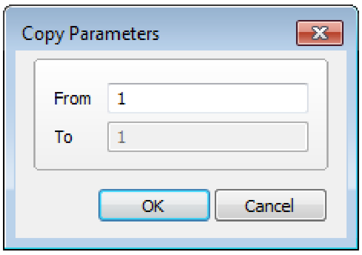



The columns of the Surface List can be set by clicking on the icon in the upper right corner of the list; the following dialog will pop up:


| | |
|---|---|
| ID | The unique number of the surface |
| Type | The support type given to this surface. |
| Triangles | Amount of triangles of the surface. |
| X Min | The starting dimensions of the surface. |
| Y Min | |
| Z Min | |
| X Max | The ending dimensions of the surface. |
| Y Max | |
| Z Max | |
| Surface Area | The surface area of the surface. |
| Border Length | The border length of the surface. |
| On Part | The support surface is attached to the part. |
| On Platform | The support surface is attached to the platform. |
| Surface Profile | A support profile, created by the user, is used. |

A right mouse click in the surface list will pop up the following:

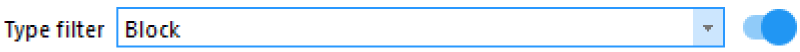


| | |
|---|---|
| Invert Selection | The unselected surfaces will become selected and the selected surfaces will not be selected anymore. |
| Select All | All surfaces will be selected. |
| Select None | All surfaces will be deselected. |
| Delete Surface | All selected surfaces will be removed from the surface list. |
| Duplicate Surfaces | The selected surface will be duplicated. This gives the possibility to use different support types for one surface.<br>(e.g. Volume support in combination with block support for the metal market) |
| Copy Parameters From | <br>Copy the support type and all parameters from the given support number to the selected support numbers. |
| Merge Selected Surfaces | The selected surfaces will be merged into one surface. |
| Sort | You can sort the Surface List according to the columns. You can also sort by clicking on the title of the column. |
| Reverse Order | The sorted order is reversed. |
| Restore Order | The order is restored. |
| Save Order | The order is saved. |

### *3.8.2.1 Browsing through the supports*

The complete down facing surface will be split into multiple surfaces, which each have their support structure. You can browse through these surfaces in two ways:

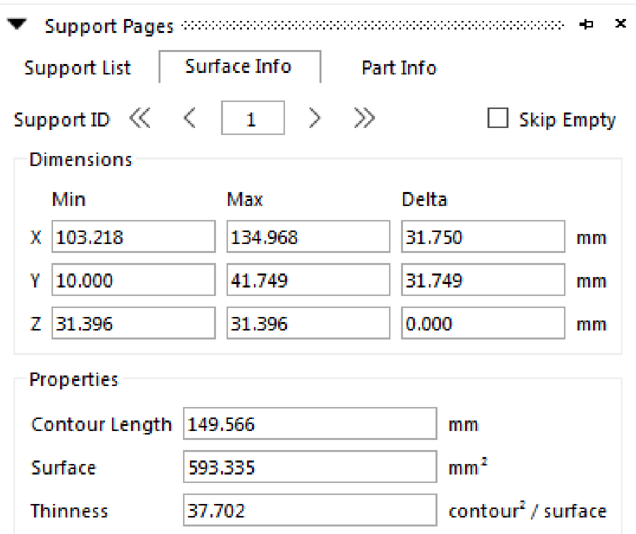
- By enabling the type filter to visualize only the supports of a desired type
- By using the navigation buttons




| | |
|---|---|
| Type filter | This is a dropdown list. Click on the field to open the list of support types to choose from. Only the created support types will be visualized in the list, in alphabetical order. |
| Switch | Click once to enable the filter, and click again to disable it. |


| | |
|---|---|
| « | Return to surface one. |
| ‹ | Return to the previous surface. |
| 1 | Window showing surface number. |
| › | Go to the next surface. |
| » | Go to the last selected surface. |
| Skip Empty Supports | All surfaces which are selected by the surface angle but do not need supports following the selection parameters (no support offset, surface filter…), are skipped. |

## 3.8.3 Surface Info page



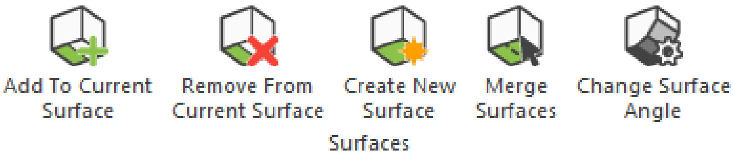

| | | |
|---|---|---|
| Dimensions | Min X Y Z | The dimensions of the surface. |
| | Max X Y Z | |
| | Delta X Y Z | |
| Contour Length | The contour length of the surface. | |
| Surface | The surface area of the surface. | |
| Thinness | This parameter represents the thinness (slenderness) of the surface. | |
| Browsing buttons | Browsing buttons are used to browse through the different surfaces. The buttons are explained above. | |

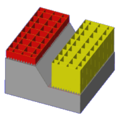
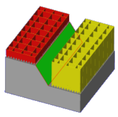
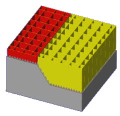
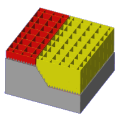
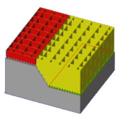
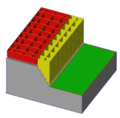
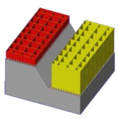
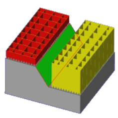
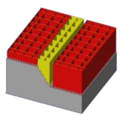
### 3.8.4 Part Info page

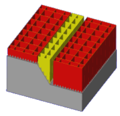
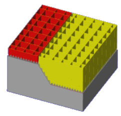
See Part Info page, page 412

### 3.8.5 Modifying the surfaces

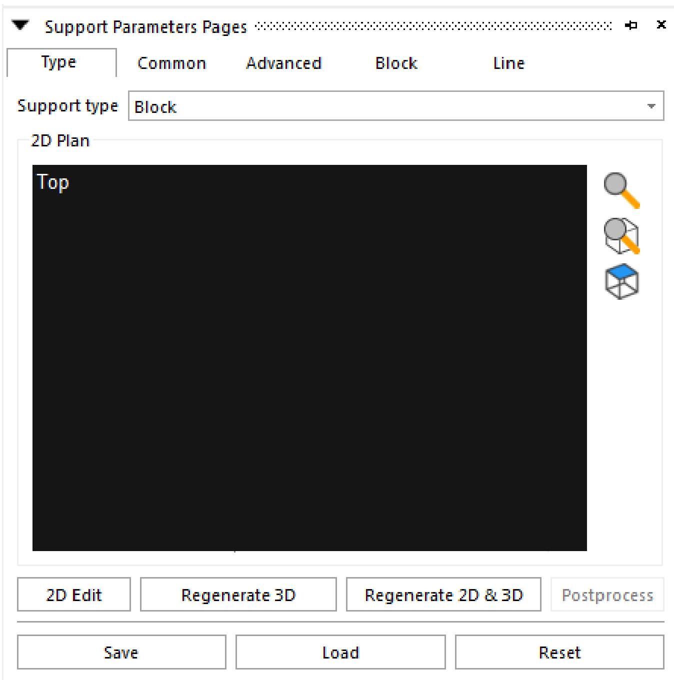
In the ribbon of the support mode you can find tools to modify the selected surfaces.




| | | | |
|---|---|---|---|
| Add To Current Surface | The marked triangles will be added to the current surface. When you press Regenerate 2D & 3D, Magics will also generate support for these triangles. | | |
| | Begin situation  | Triangles to be added are marked  | Triangles are added to support  |
| Remove From Current Surface | The marked triangles will be removed from the current surface. When you click Regenerate 2D & 3D, Magics won't generate supports anymore for the marked triangles. | | |
| | Begin situation  | Triangles to be removed are marked  | Triangles are removed from surface  |
| Create New Surface | The marked triangles will become a new surface, which you can support. | | |
| | Begin situation  | Triangles to be added as new surface are marked  | Triangles are added as new surface  |
| Merge Surfaces | Magics will merge the current surface with a given support. | | |

| | | | |
|---|---|---|---|
| | egin situation  | The middle surface will be merged with surface nr 1  | The surfaces are merged  |
| Change surface angle | When a surface makes an angle smaller than the entered surface angle it is considered not self – supporting, so support is generated for the respective surface. | | |

### 3.8.6 Support Toolbox



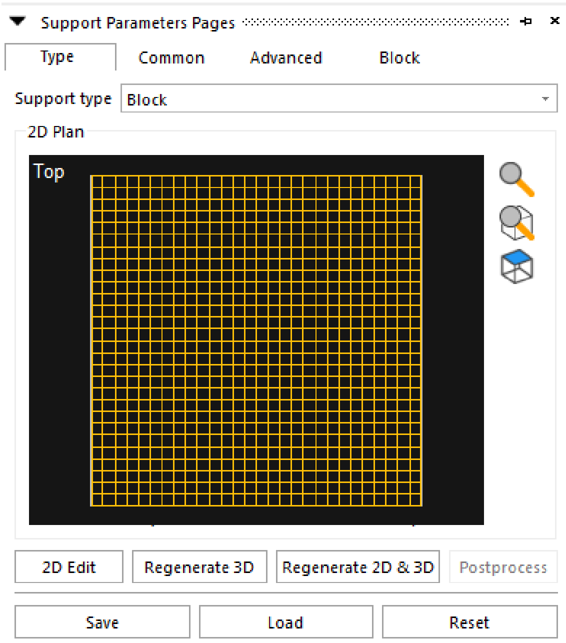

The Support Toolbox is a dynamic box, when selecting a surface the box will display the Toolpages regarding the selected surface.

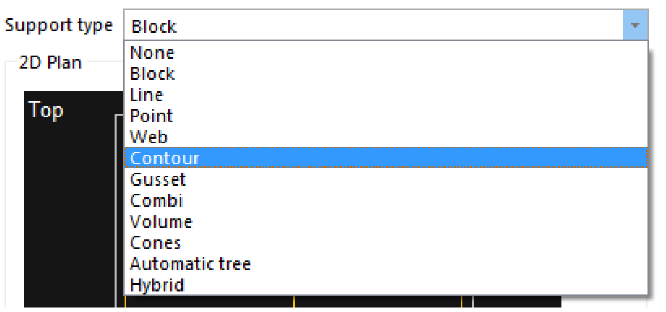
| | |
|---|---|
| 2D Edit | A new window appears with a 2D representation of the part, you can start 2D editing. |
| Regenerate 3D | The 2D ground plan will be used and the supports will be trimmed again on the part using the wanted parameters. |
| Regenerate 2D & 3D | The selected support type will be completely regenerated. The changes done in the 2D-editing mode will be ignored. When you changed a parameter (E.g. teeth) and you want to apply those settings after you did some 2D changes, press the Regenerate 3D button. |
| Postprocess | Cones and volume supports can be made hollow and/or supports can be filled with a lattice structure via post processing. |

| | |
|---|---|
| Save | Any type of support parameters can be saved. |
| Load | Load a set of support parameters that you have defined earlier. |
| Reset | Restores the parameters of the selected surfaces with the parameters from the current machine file. |

<u>*Remark*</u>: The save and load functionality makes it possible to use different parameters for the same support types. The support parameter file is by default saved in the Support Library folder. ( See Settings – Supports Library folder)

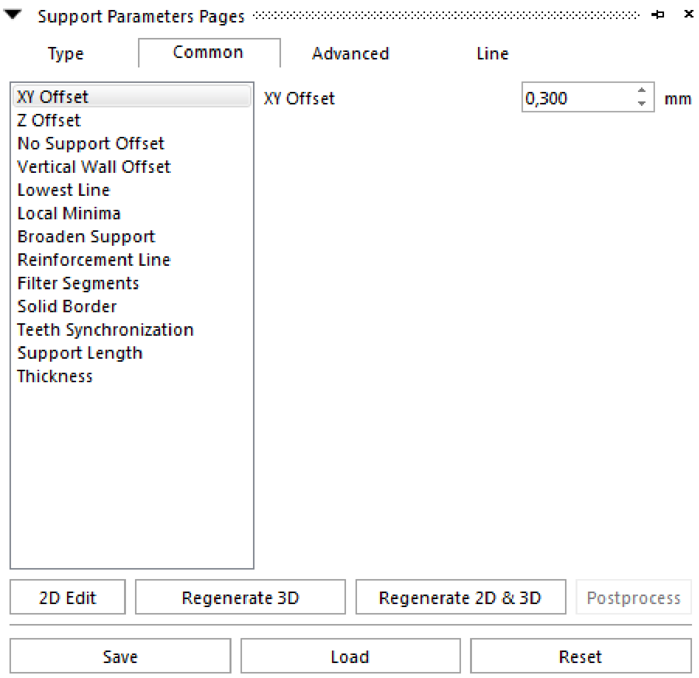
### 3.8.6.1 Type Toolpage




| | |
|---|---|
| Type | The support type given to this surface. You can change the type of the active support simply by clicking on the dropdown menu and select the desired type. If the surface does not need any support, None is marked.<br>E.g. from Block support to Contour support:<br> |

| | |
|---|---|
| 2D Plan | This is a 2D overview to see where the surface with the support is located on the part. The top view of the part is displayed. The user is able to zoom and pan in this window by use of the mouse. To pan: click the mouse middle button somewhere in the window and pan. To zoom: press Ctrl and the right mouse button to zoom while moving the mouse, or simply scroll with the mouse middle button. |
| Zoom | Click to zoom in on the 2D plan, or draw the rectangular area you want to zoom into. |
| Zoom on part | Click to zoom until the part is completely visible on the 2D plan. |
| Flip View | Switch view of the part between top and bottom. |

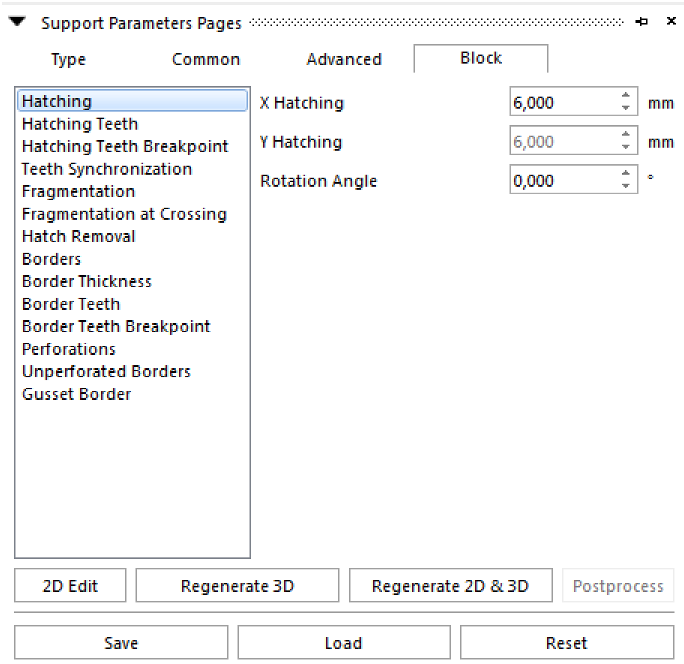
### 3.8.6.2 Common Toolpage




Detailed explanation on the common parameters can be found at the common support parameters from the machine properties.

— See Common, page 527

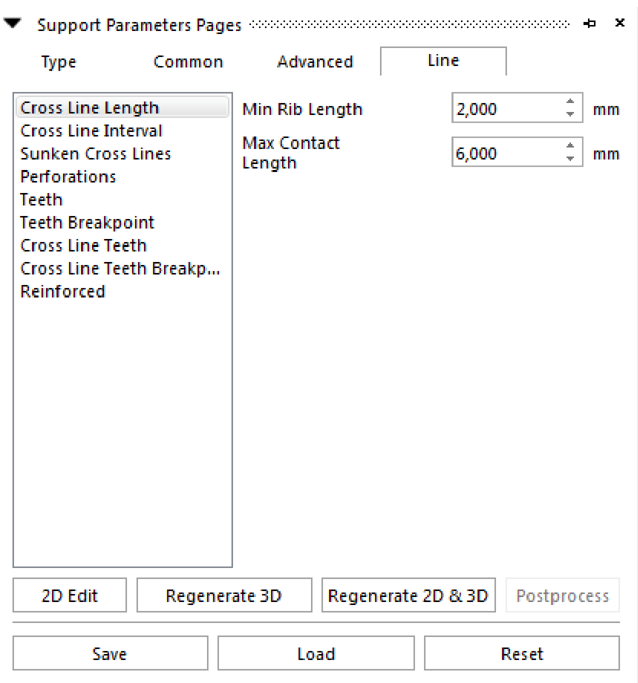
### 3.8.6.3 Block Toolpage




Detailed explanation on the block parameters can be found at the block support parameters from the machine properties.

— See Block, page 575

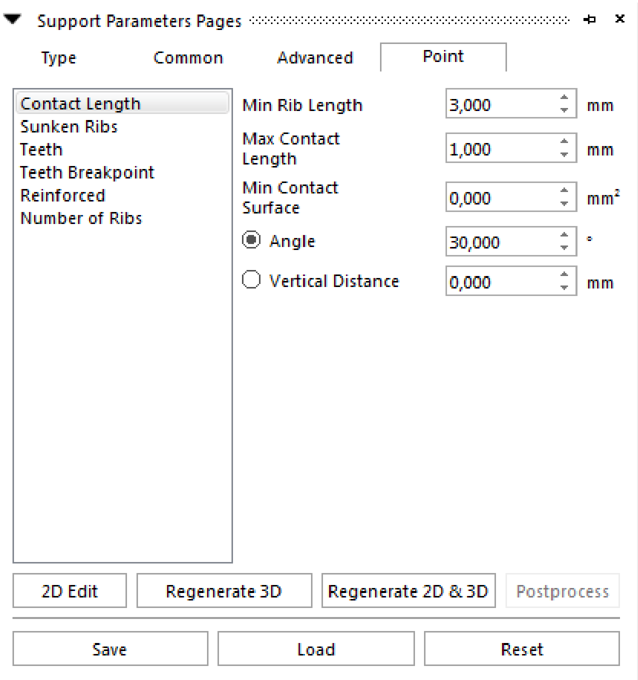
### 3.8.6.4 Line Toolpage



Detailed explanation on the line parameters can be found at the line support parameters from the machine properties.

— See Line, page 547

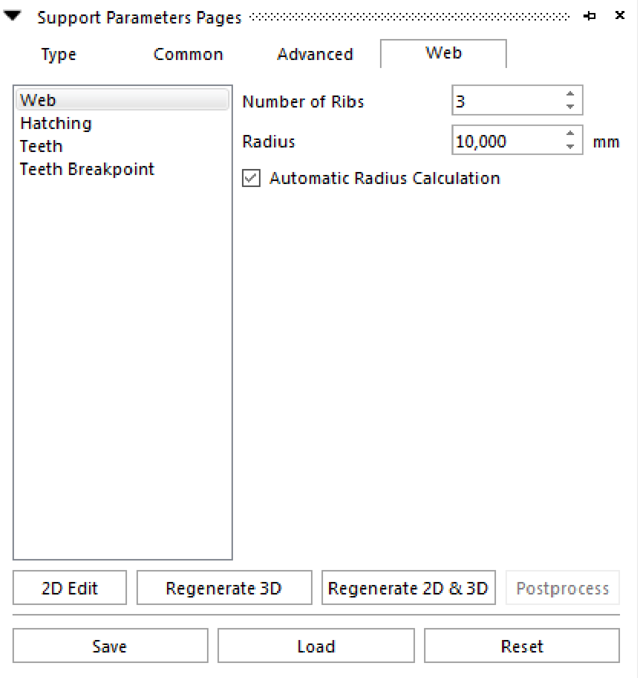
### 3.8.6.5 Point Toolpage




Detailed explanation on the point parameters can be found at the point support parameters from the machine properties.

— See Point, page 540

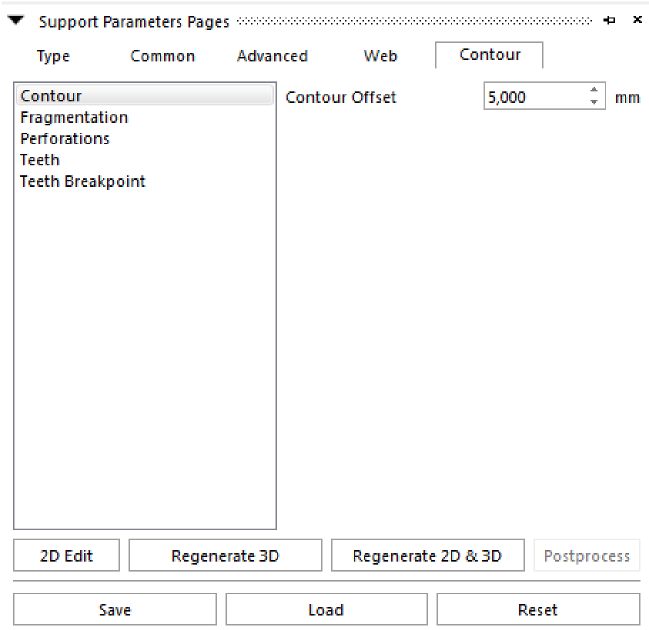
### 3.8.6.6 Web Toolpage




Detailed explanation on the web parameters can be found at the web support parameters from the machine properties.

- See Web
- , page 569

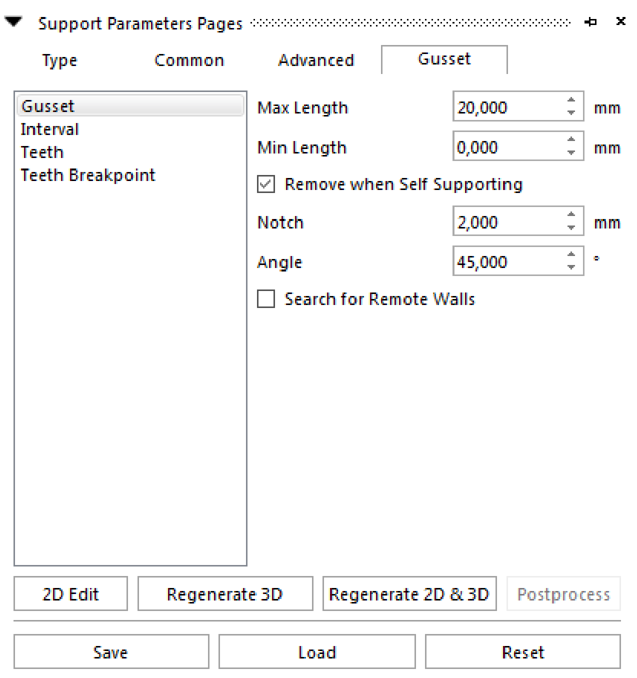
### 3.8.6.7 Contour Toolpage




Detailed explanation on the contour parameters can be found at the contour support parameters from the machine properties.

— See Contour, page 598

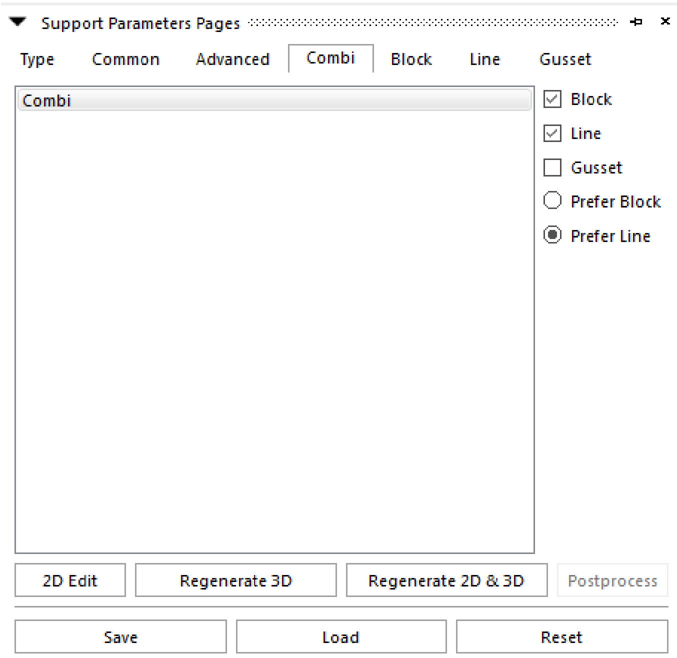
### 3.8.6.8 Gusset Toolpage



Detailed explanation on the gusset parameters can be found at the gusset support parameters from the machine properties.

— See Gusset, page 605

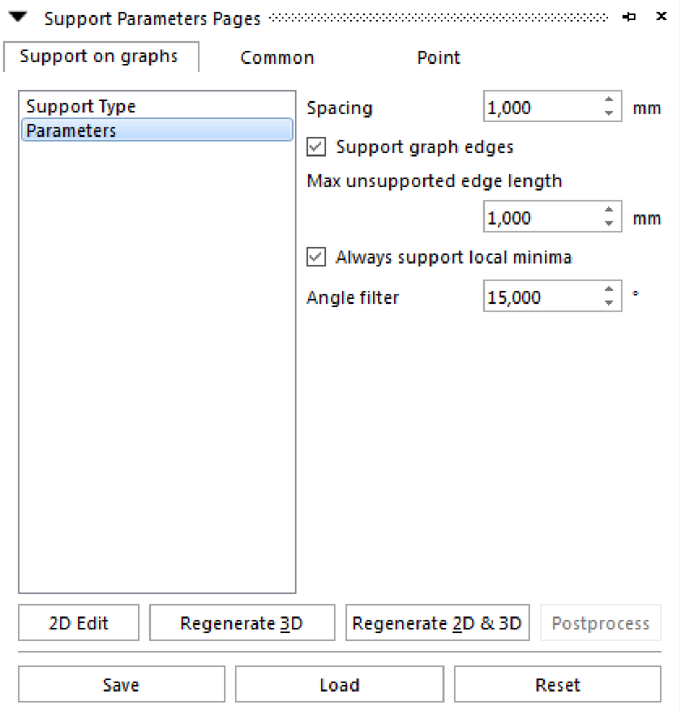
### 3.8.6.9 Combi Toolpage




Detailed explanation on the combi parameters can be found at the combi support parameters from the machine properties.

— See Combi, page 611

### 3.8.6.10 *Support on graphs Toolpage*




Detailed explanation on the ‘support on graphs’ parameters can be found at the ‘support on graphs’ support parameters from the machine properties.

— See Support on graphs, page 612

## 3.8.7 2D and 3D Editing of Supports

Magics RP allows you to do 2D and 3D editing of supports.

The basic 2D operations are:

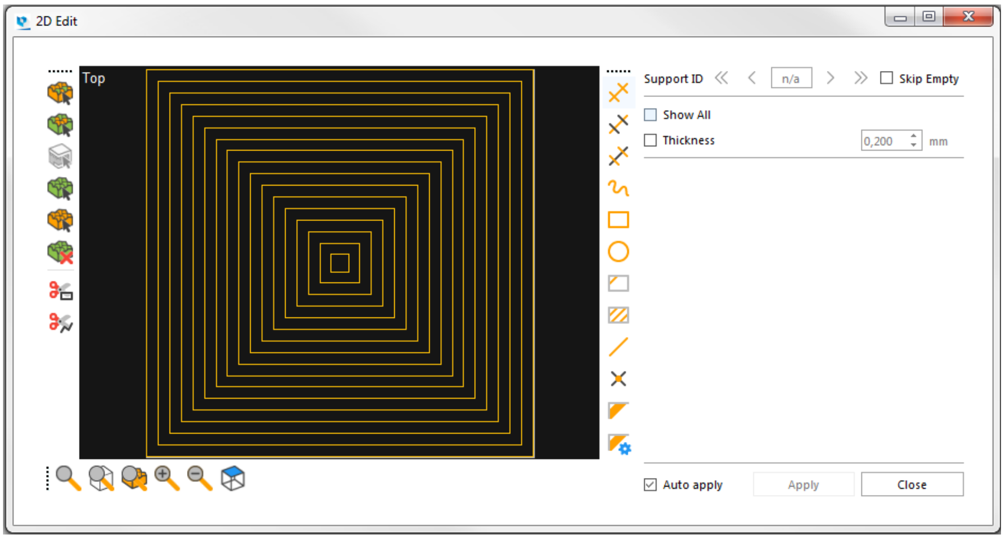
1. Selecting support structures or parts of support structures.
2. Deleting selections.
3. Cutting support.
4. 2D drawing of supports, which are then directly trimmed in 3D on the part.

The basic 3D operations are:

1. Selecting support structures or parts of support structures.
2. Deleting selections.

### *3.8.7.1 2D Editing*

To start the editing in 2D, click the 2D Edit button in the Type Toolpage. A new window appears with a 2D representation of the part (see figure below).




### 3.8.7.1.1 Zoom toolbar

| | |
|---|---|
| | Zoom: Click and drag to zoom in on the desired window. |
| | Zoom on part: This is an automatic zoom to make the entire part visible. |
| | Zoom on surface: This is an automatic zoom to make the entire selected surface visible.<br>When a new surface is selected, the zoom on surface will be automatically performed. |
| | Zoom in and Zoom out: By clicking either of these buttons you zoom in/out around the center of the image with a fixed zoom factor. |
| | Flip view: Switch view of the part between top and bottom. |

The regular zoom and pan buttons allow you also to zoom and pan in the 2D edit window.

### 3.8.7.1.2 Selection toolbar

While selecting or cutting, pan and zoom functions are available.

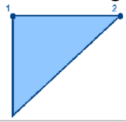
| | |
|---|---|
| | Item: Selects one line of the active support. A second click will deselect it. |
| | Select Polyline: Selects a polyline of the active support. A second click will deselect it. |
| | Part to Part Items: Selects all lines of the active support that have a part to part connection. |

| | |
|---|---|
| | Support: selects the whole support. |
| | Deselect all:  Deselect all selected supports. |
| | Delete selected: Delete all selected support structures. |
| | Cut: Click and drag on the 2D image to create a window selection. All support items inside the window will be cut and deleted. |
| | Polyline cut: Draw a polyline on the 2D image. Close the polyline or click the right mouse button to exit the command. All support items inside the polyline will be cut and deleted. |

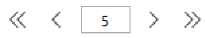
### 3.8.7.1.3 Drawing toolbar

While editing support, pan and zoom functions are available. This means you can zoom on a certain detail, indicate the first point of e.g. a line support, then zoom and pan to another detail and indicate the second point of the line support.

| | |
|---|---|
| | Draw a line support without cross lines. Click to place points. |
| | Draw a single cross line support. |
| | Draw a line support with cross lines. Click to place points |
| | Draw a freeform line support. Click and drag to draw a freeform shape. |
| | Draw a line support in a rectangular shape. Click to define the rectangle corners. |
| | Draw a line support in a circular shape.<br>There are 2 possible ways to create a circular support:<br>— Draw circle by 3 points<br>— Draw circle by center and radius<br>Select the appropriate option to use at the right side of the 2D edit-box. |
| | Draw a single line support with direction, by indicating one point and the direction. The line will be trimmed on the border. |
| | Draw multiple line supports with direction, by indicating one point and the direction. Define the number of lines and the distance between the lines with the parameters on the right side of the 2D edit-box. The lines will be trimmed on the border.<br>Number lines 3<br>Lines interval 1,000 mm |
| | Draw a reinforcement line to strengthen existing support. |
| | Draw a point support. Click to define the center and the direction of the ribs. |

| | |
|---|---|
|  | Draw a single gusset support. 1st point sets the base side, while 2nd point sets the gusset length.  |
|  | Draw multiple gusset supports by indicating the shape of the base side. Gussets will be placed perpendicular to the base. |

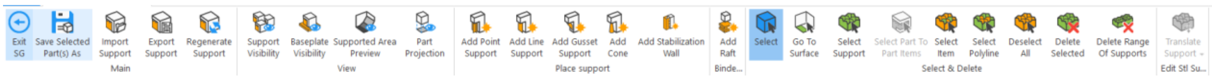
### 3.8.7.1.4 Support browsing and Apply

| | | |
|---|---|---|
|  | Browse through the supports | |
| | First button | Return to surface one. |
| | Second button | Return to the previous surface |
| | Window | Surface number. |
| | Third button | Go to the next surface |
| | Fourth button | Go to the last selected surface |
| Skip Empty Supports | All surfaces which are selected by the surface angle but do not need supports following the selection parameters (no support offset, surface filter…), are skipped. | |
| Show All | Shows all the supports | |
| Thickness | Visualize the thickness for the non-solid support. The default value corresponds to the laser spot diameter defined in the Machine Properties. | |
|   | When the Auto apply checkbox is selected, all manual drawing of the support will be calculated and visualized in 3D automatically. | |
|   | The manual drawing of the support will be calculated and visualized in 3D. | |

You can find the 3D editing tools in the Support ribbon and in the Surface ribbon or Menubar/Tools.

## *3.8.7.2 3D Editing*

### 3.8.7.2.1 The Support ribbon




| | |
|---|---|
| Show/Hide e-Stage | Show the generated e-Stage support |
| View All Support | Show all the generated supports. |

| | |
|---|---|
| View All Parts | Show all parts in the scene and their corresponding supports |
| Supported area preview | Visualize in advance the areas that need support. Based on the provided surface angle, the supported areas are indicated with color codes. |
| Show/ hide part projection | Activating this option will show you with a support projection area visualize the support on your platform before it is actually created. |
| Add point support | The user can draw point support in 3D. |
| Add line support | The user can draw line support in 3D. |
| Add gusset support | The user can draw gusset support in 3D. |
| Add Cone | The user can draw cone support in 3D |
| Add Stabilization Wall | The user can add a vertical support wall to support thin and tall parts during FDM printing process |
| Add Raft | The user can add smear raft under the support in 3D |
| Go to surface | If the View all Button is active, clicking on a red support (not selected) makes it active. |
| Select support | Selects one line of the active support. A second click will deselect it. |
| Select part to part items | Automatically selects the items of a support which are going from part to part. |
| Select item | Select an item. A second click will deselect it. |
| Select polyline | Selects a polyline of the active support. A second click will deselect it. |
| Deselect all | Deselects all selected support. |
| Delete selected | Deletes all selected support structures. |
| Delete range of supports | A dialog box that allows inserting a range of supports that you want to have deleted pops up. |

*Remark 1*: Changing the active part without exiting SG

When the 'View all parts' toggle is on, it is possible to change the active part in SG by left clicking on the desired part in the scene.

*Remark 2*: Draw line, point, gusset on non-marked surface

It is possible to draw a line, point or gusset supports directly on the part surface without creating support surfaces. This is very useful to add additional supports without the need to first mark the area and create a support surface out of it.

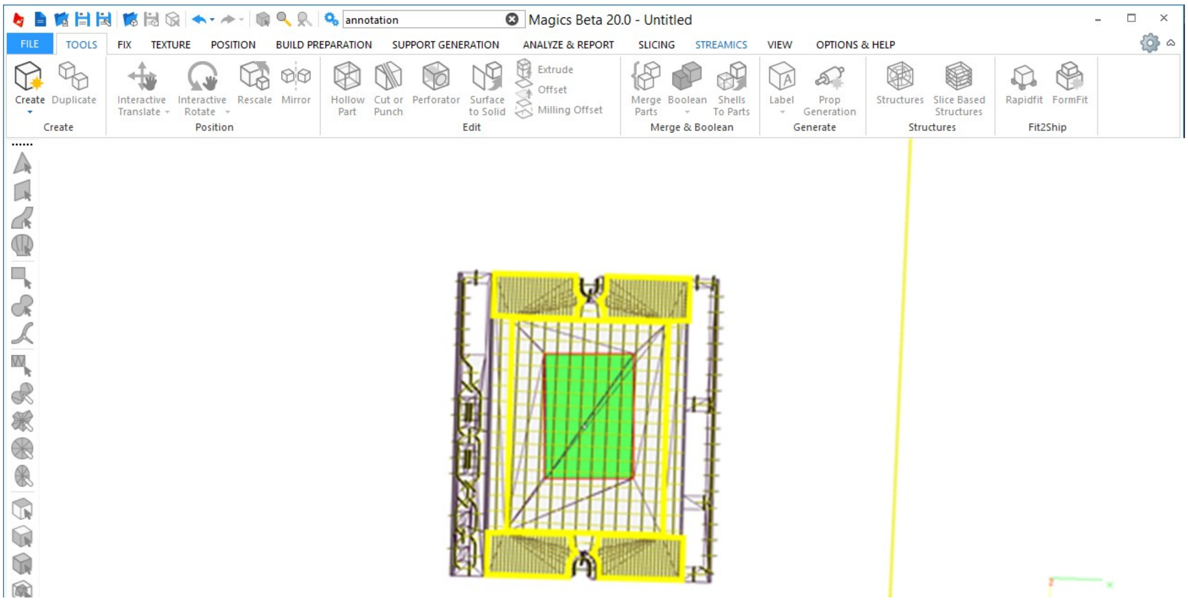
In order to manually draw supports please click on the specific type of support you would like to generate (point, line, gusset). In case of line support draw the path using points and once completed click on the right mouse button to generate support. If you are trying to generate gusset support please select first the starting point then the final point of your gusset.

Magics will automatically generate new surfaces in the support list.

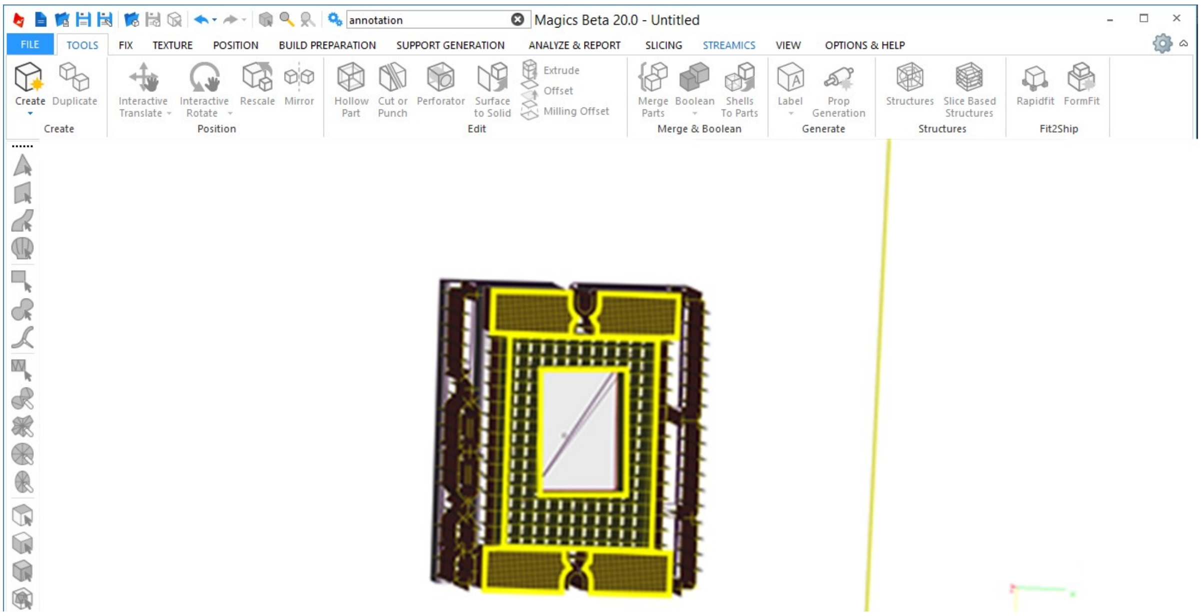
Please hold CTRL to add new support to the existing surface. Surface will be automatically updated. Notice that new type of support always starts new surface.

3.8.7.2.2 Using marking with remesh options in SG

Once you have automatically generated support surfaces in the SG module you have the possibility to mark triangles and add/remove them to/from triangles to certain surfaces or generate new surfaces made by the marked triangles. Marking with remesh can be used to select specific areas of the part that need additional support. This marked area can be used to create a new support surface to generate specific supports for this area. Please mark specific triangles using one of the marking with remesh functionalities (Window, Freeform, Polygon) and try to remove them from the current surface (see section below).




Already after marking you are able to see Magics remeshes triangles around the selected ones. After removing from the surface regenerate support 2D&3D to apply results.

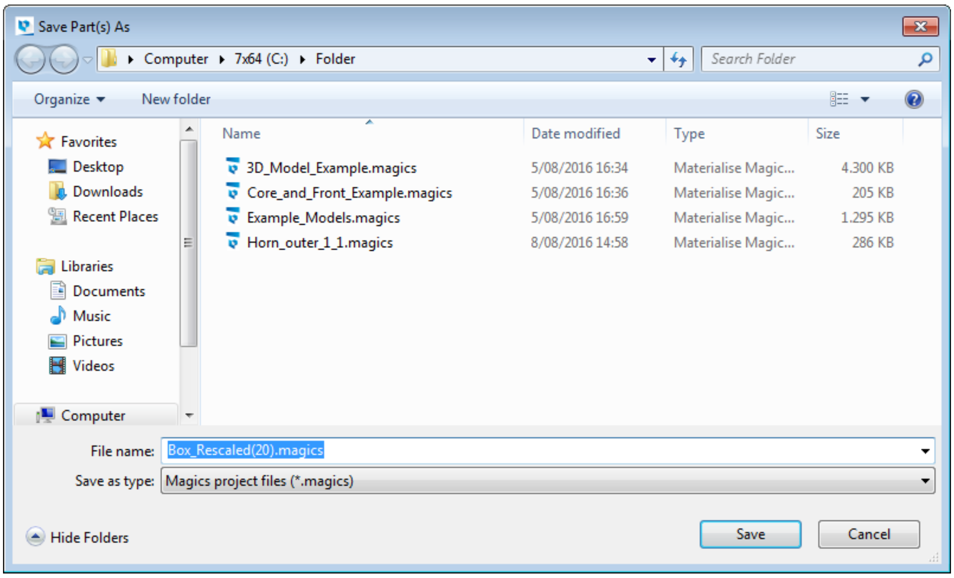


This tool allows flexible manipulation of support surfaces in SG mode to create better customized support surfaces.

## 3.9 Saving and Exporting Supports

### 3.9.1 Save Support

You can save the generated supports in the Magics application. This can be done by going to File/Save part as. The file is then saved as a .magics file. You can quit the program, and load the .magics project again. A dialog box appears to ask if you want to open the part with or without support (see figure below). Support made in Magics 9 or earlier versions was saved as .sup file. These support files can be loaded into the project by Modules/Support Generation/Load Support File(s).

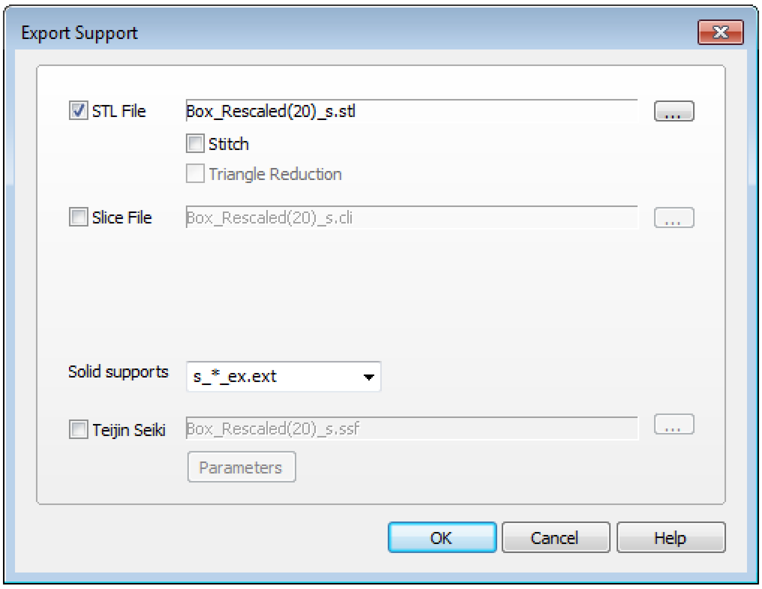



### 3.9.2 Export Support

You can also Export the generated supports towards different slice formats and the STL format. The choice of export file depends on your machine. To use the supports on your RP machine, you must use the Export functions, not the Save functions.

— If you also have the Slice Module (Slicing of Parts):

Go to File and select Export Support. Fill in a name, choose the directory in which all export files will be placed. Now you can set your slice parameters. Press OK and Magics starts generating the STL files and starts the slicing of both the part and the support. (see Slicing for the explanation of the parameters).




— If you do not have the Slice Module:

Go to Support Generation in the Modules Menu and select Export Support or in the support mode choose file in the menubar, and Export support. Now you can set your slice parameters. Press OK and Magics starts generating the STL file and the slice file of the supports.

## 3.10 Visualization of Support Structures

Visualization options of the support structures are defined in the Settings, on the page Supports (Settings/Visualization/Supports).

— See Supports on page 335

Show or hide the support of all parts present on the scene by using the command Support Visibility (see more information in paragraph Support Visibility).

## 3.11 Machine Setup

Machine properties can be consulted by going to File/Machines/My Machines. Select the appropriate machine and then click with the right mouse button and select Edit option.

### 3.11.1 Build Time Estimation

— See Build time estimation page, page 249

### 3.11.2 Cost Estimation

— See Cost estimation page, page 253

# 4 Chapter 4: SG+

The goal of the support generation for Metal is to provide the necessary tools where the traditional SG fails to serve the customer. The traditional support generation was mainly designed for SL uses as to prevent the part from sinking in the polymer. Yet other needs are necessary when it comes to metal fabrication.

During the metal fabrication process a lot of internal stress is being created inside the metal. This results in additional roles of the support, namely to anchor the part and to provide a way for heat transfer. Another issue in the metal fabricating process is the finishing of parts. Ideally as fewer surfaces should be supported as possible, as it takes a lot of effort to remove support.

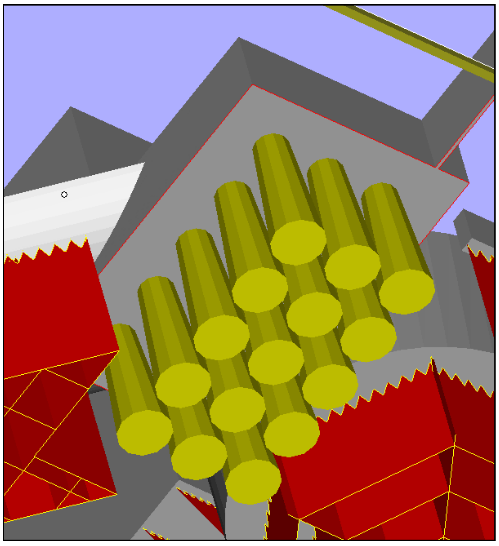
This module will address named issues by introducing solid supports and the ability to put supports underneath an angle as to reduce finishing.

## 4.1 Introduction

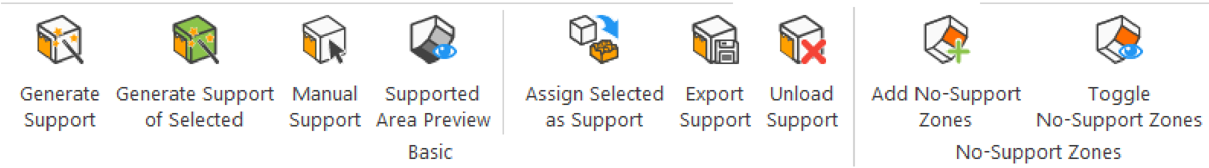
The traditional SL support generation algorithm is a surface-based algorithm. Depending on the angle of the surface towards the platform, the size and the shape of the surface, the surface received a support type (none-line-block-web-contour-combi-gusset). One property all these types had in common is the fact that those supports are not solid, the thickness they receive corresponds with the thickness of the laser beam.

To deal with stresses caused by metal melting, three additional support types are added which do have a volume:

- Volume supports: see Chapter 5: Volume Support Generation, page 709
- Tree support: see Chapter 6: Tree Support, page 725
- Cones



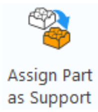
### 4.1.1 Magics – SG+ ribbon




More information can be found in the ‘Support Generation’ module.

— See Magics – Support Generation ribbon, page 507

#### *4.1.1.1 Assign part as support*




This allows you to assign any selected part as support to another part. The parts that become support can originate from e-Stage, Magics, or can be any other STL. Magics will recognize the STL as support.

You should first select one or multiple parts that need to be assigned as support. After that, press the button ‘Assign Part as Support’. This turns the selected parts into transparent support. Next, you should left click on the part in the scene that needs the support. This will assign the transparent support to the part that has been clicked.

## 4.2 SG + parameters

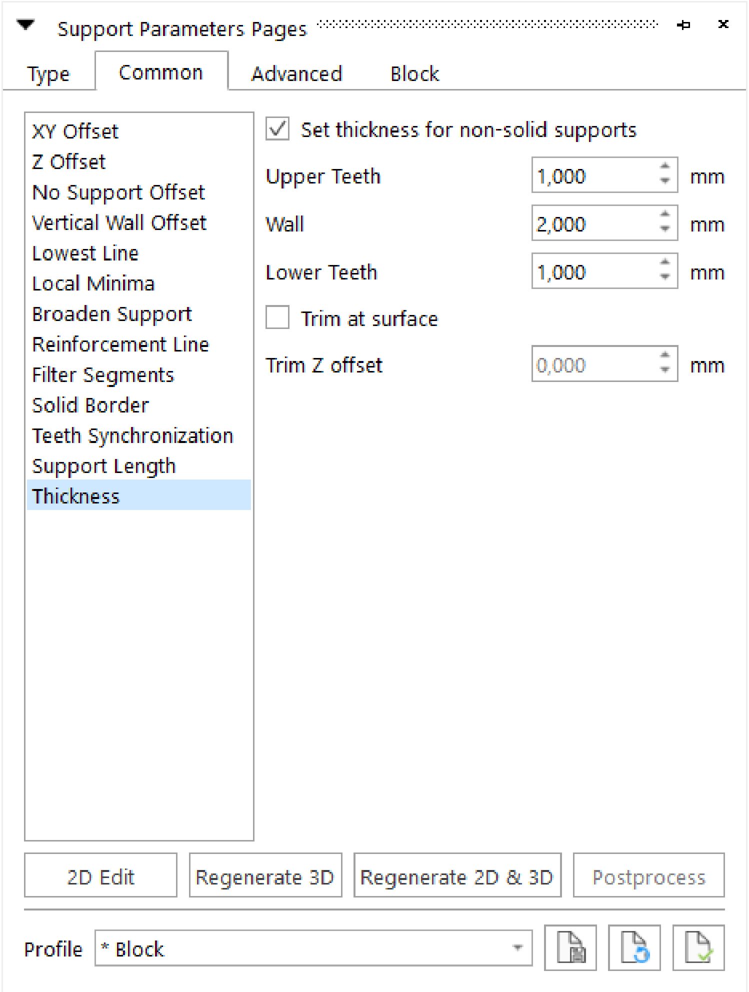
### 4.2.1 Support parameters

#### *4.2.1.1 Common*

More information can be found in the ‘Support Generation’ module.

— See Common, page 527

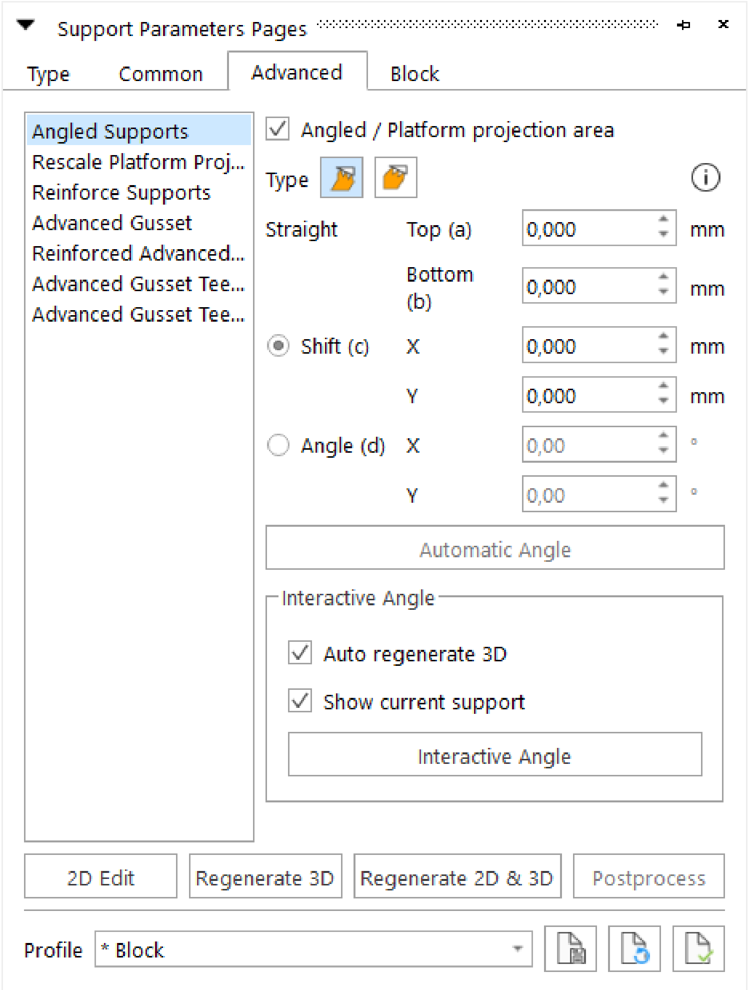
#### 4.2.1.1.1 Thickness

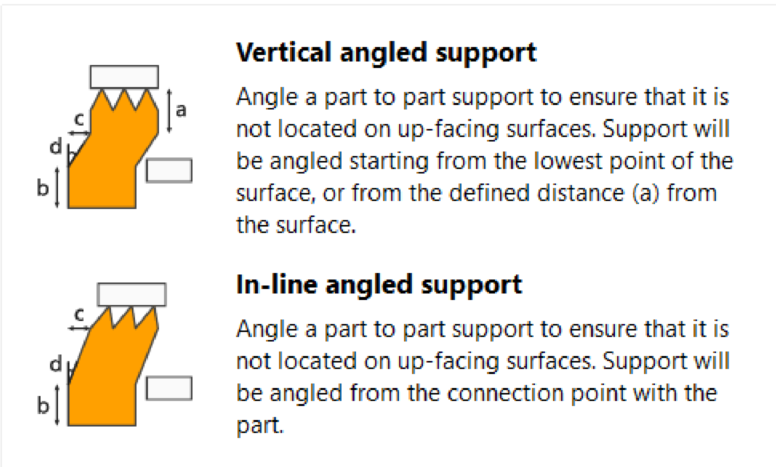



| | | |
|---|---|---|
| Thickness | Set the thickness for non-solid supports. | |
| | Upper teeth (a) | The thickness of the upper teeth in mm. |
| | Wall (b) | The thickness of the wall in mm |
| | Lower teeth | The thickness of the lower teeth in mm |
| | Trim at surface | The trim Z offset in mm |

### *4.2.1.2 Advanced*

#### 4.2.1.2.1 Angled supports

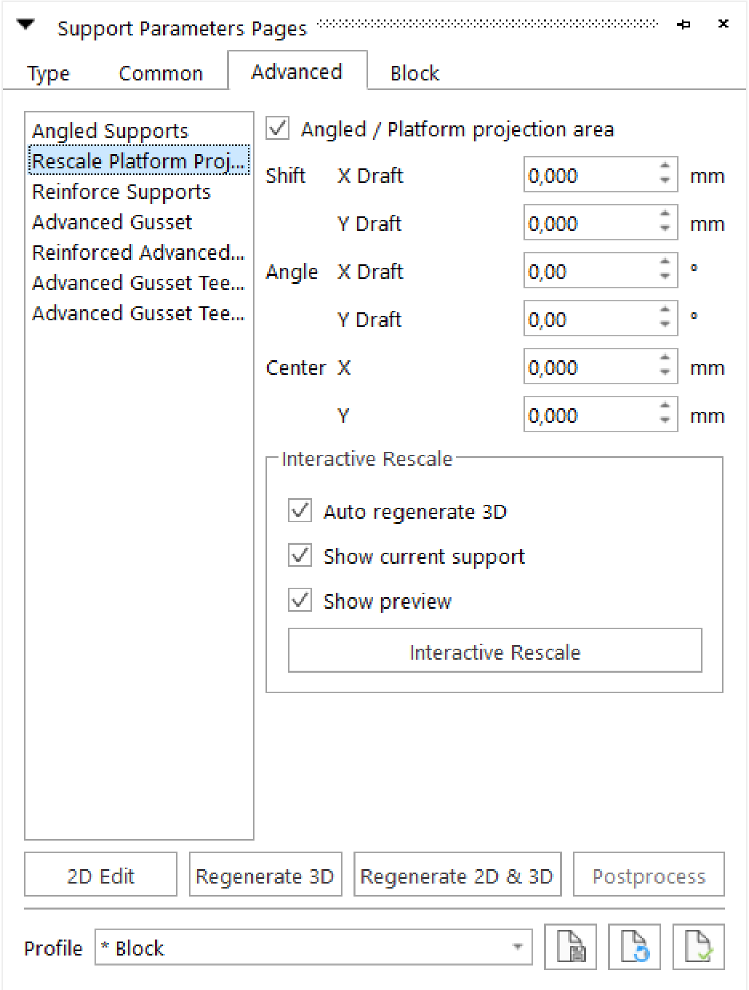



| | |
|---|---|
| Angled support | Create supports under a certain angle to prevent that the supports are located on up – facing surfaces |

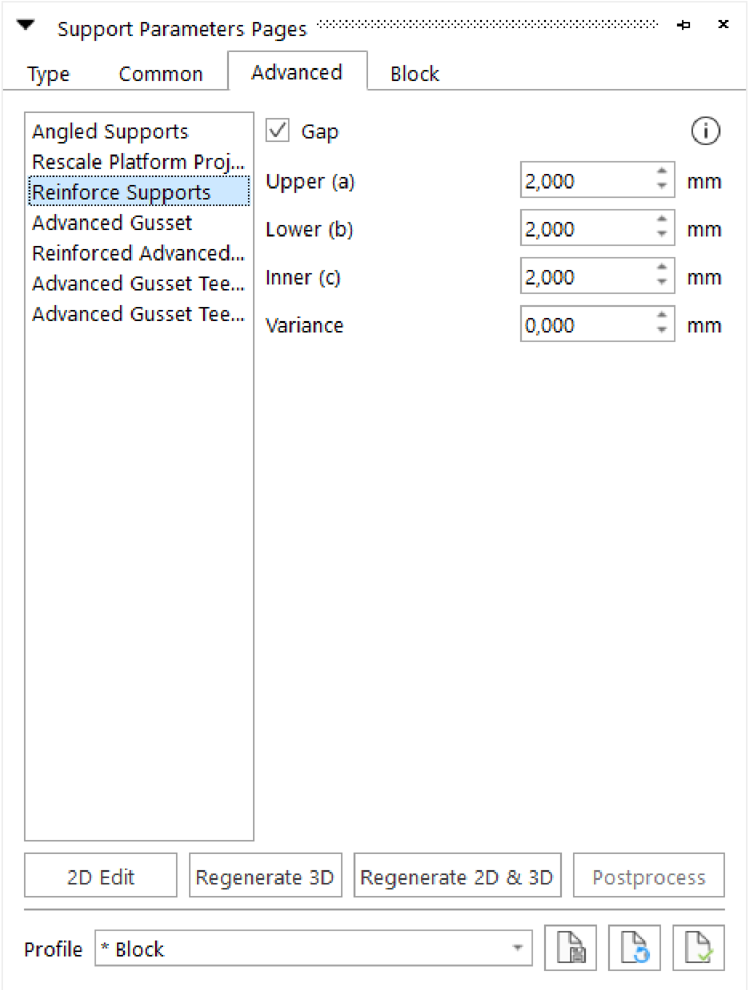
| | | |
|---|---|---|
| | Straight | Set the distance on top and bottom of the straight support |
| | Shift | Indicate how far the support have to be moved so it is placed under the desired angle |

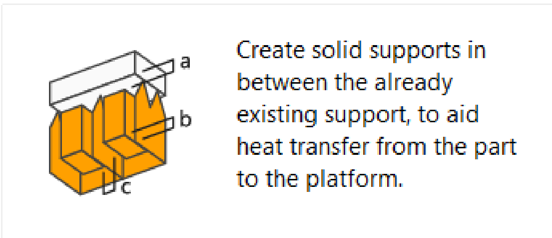
#### 4.2.1.2.2 Rescale platform projection area




| | | |
|---|---|---|
| Rescale platform projection area | Define a new projection area to be used when generating angled support. | |
| | Shift | Indicate in XY how much bigger the projection area has to be |

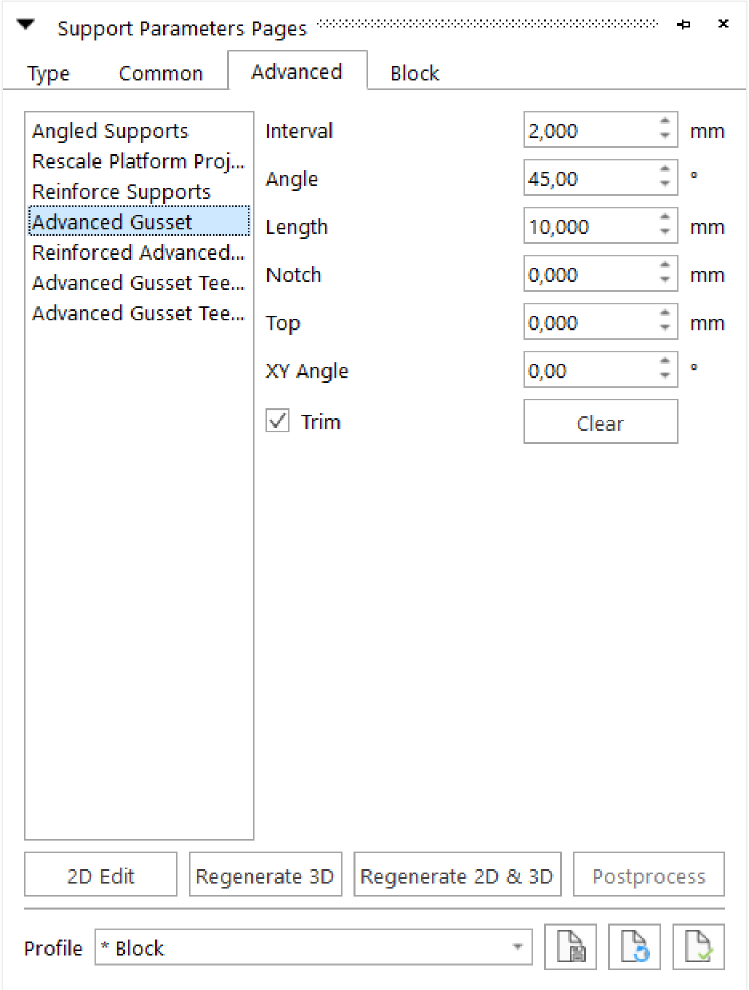
### 4.2.1.2.3 Reinforce supports



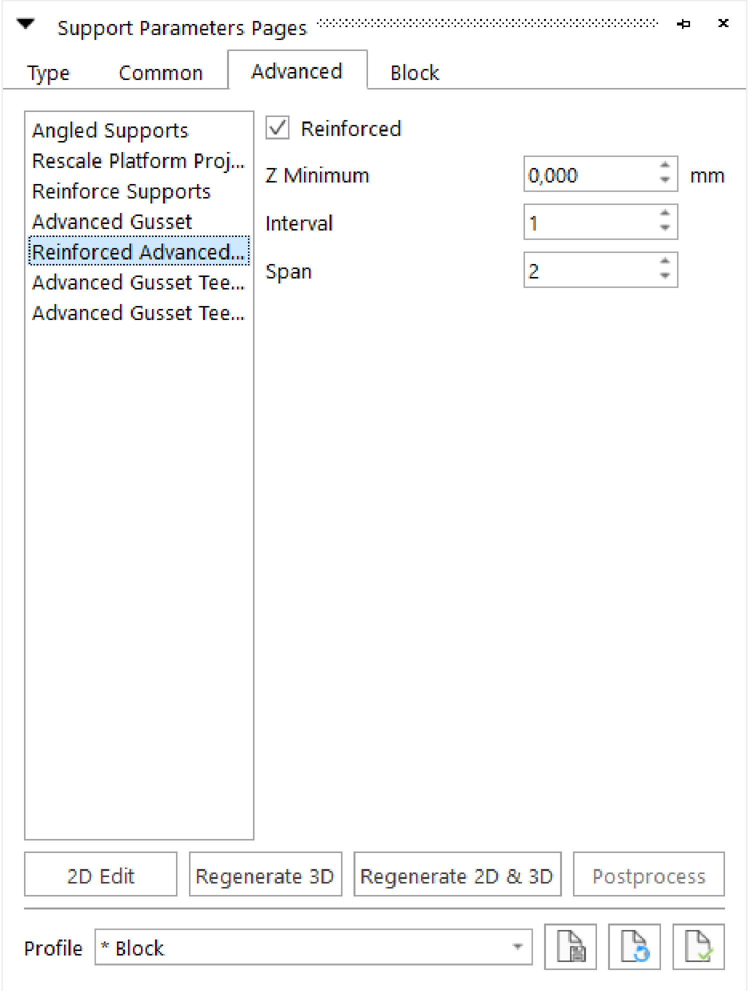

| | |
|---|---|
| Gap | Supports are reinforced by adding solid supports in between the already existing supports |
| Upper | Distance between the part and heat transferring support |
| Lower | Distance between the heat transferring support and the platform |
| Inner | Distance between existing support and the heat transferring support |
| Variance | |

### 4.2.1.2.4 Advanced gussets



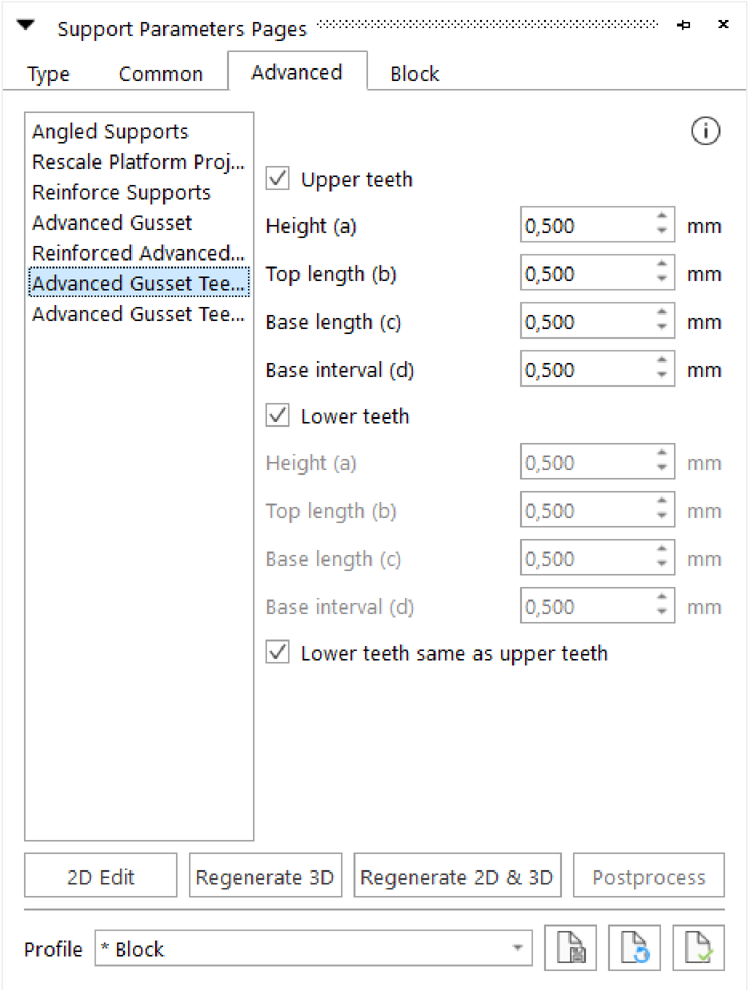

| | | |
|---|---|---|
| Advanced gusset | Edit the parameters of manual created gussets | |
| | Interval | Space in between different gussets |
| | Angle | |
| | Length | |
| | Notch | |
| | Top | |
| | XY Angle | Defines the angle the gussets make in the XY plane |
| | Trim | Trim gussets to the edges of the supported surface |

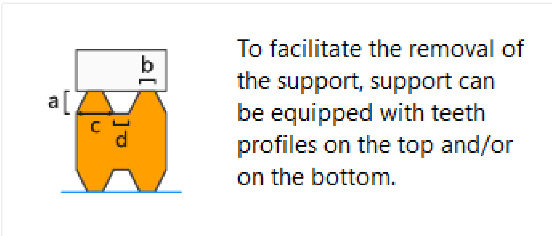
### 4.2.1.2.5 Reinforced Advanced gusset



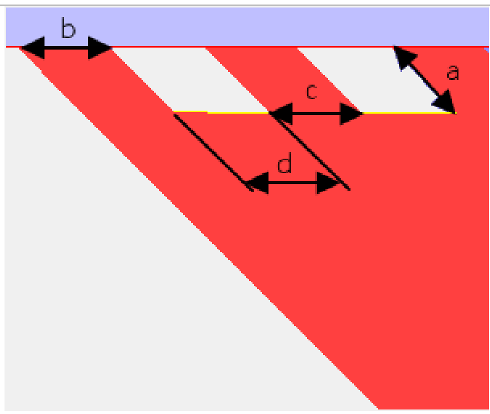

| | | |
|---|---|---|
| Reinforce | Create reinforcements for manually created gussets | |
| | Z min | the building height of support must exceed an adjustable threshold height |
| | Interval | Space in between the reinforcement gussets |
| | Span | Total amount of reinforcement gussets |

### 4.2.1.2.6 Advanced gusset teeth

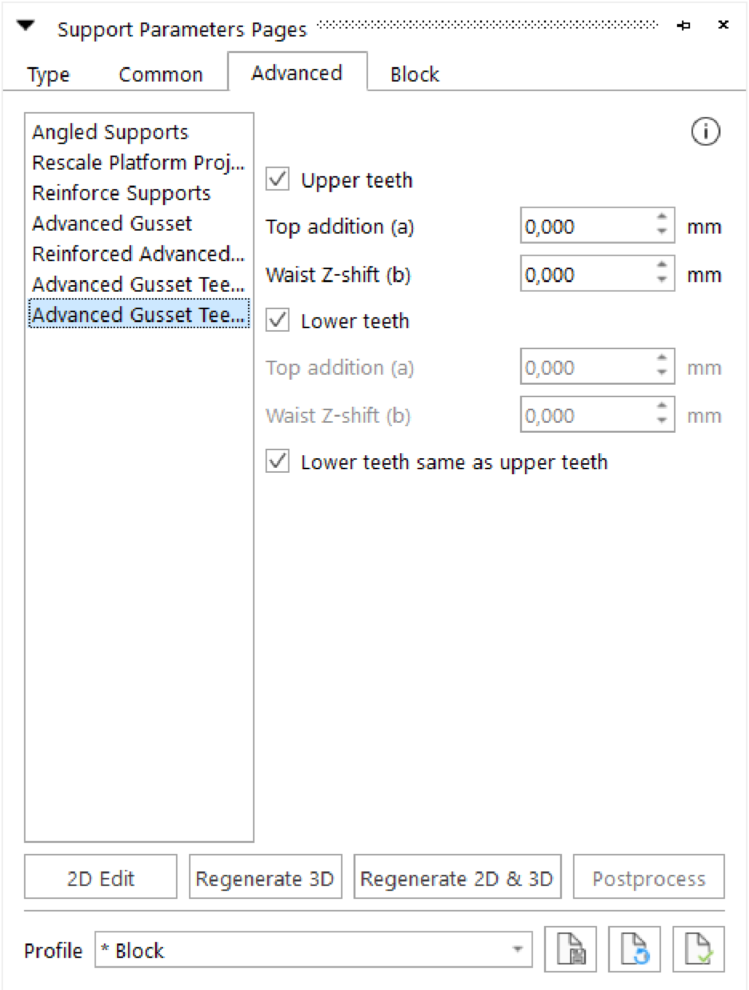



| | | |
|---|---|---|
| Advanced gusset teeth | Optimize your gussets.<br>Gussets can lean on the platform, no teeth are created here. | |
| | Upper | You can specify whether you want Upper Teeth and/or Lower Teeth. Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Lower | |
| | Height (a) | |

| | | |
|---|---|---|
| | Top length (b) |  |
| | Base length (c) | |
| | Base interval (d) | |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

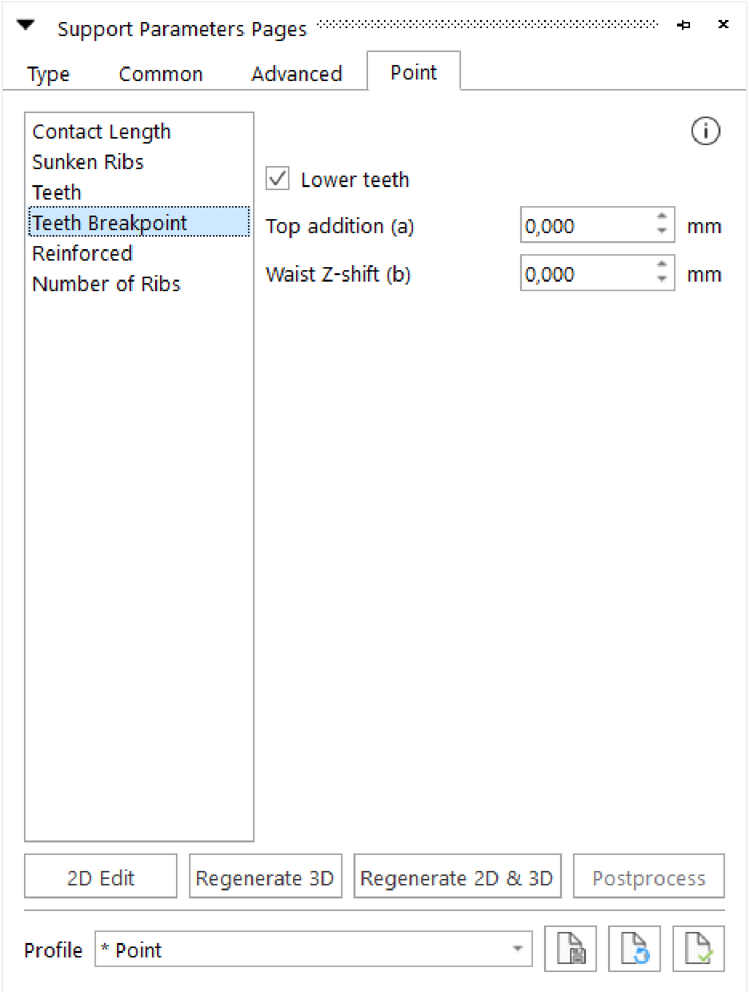
### 4.2.1.2.7 Advanced gusset teeth breakpoint

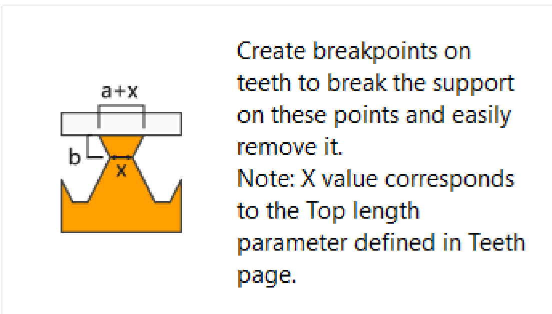


| | | |
|---|---|---|
| Advanced gusset teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Upper | Define parameters for upper and lower teeth. Lower Teeth are only used if the support is trimming on another part. If the support is trimmed on the platform, there are no lower teeth. |
| | Lower | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

### *4.2.1.3 Point*

#### 4.2.1.3.1 Teeth breakpoint




| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |

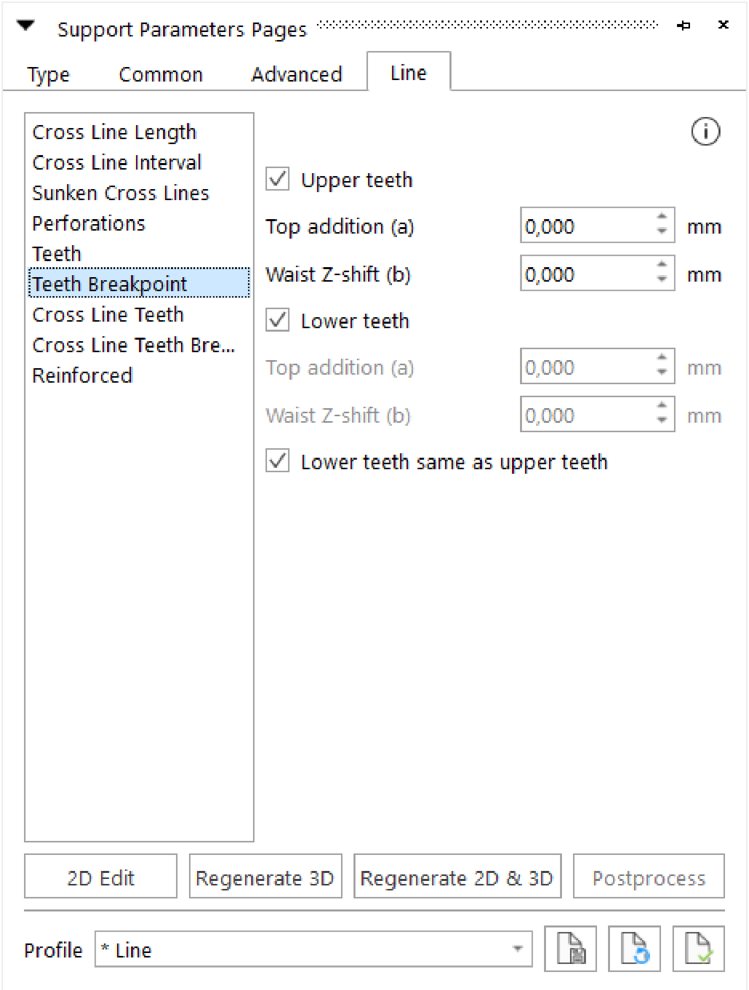
### 4.2.1.3.2 Other

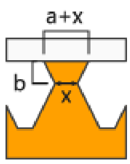
More information on the other parameters can be found within the ‘Support Generation’ module.

— See Point, page 540

## *4.2.1.4 Line*

### 4.2.1.4.1 Teeth breakpoint

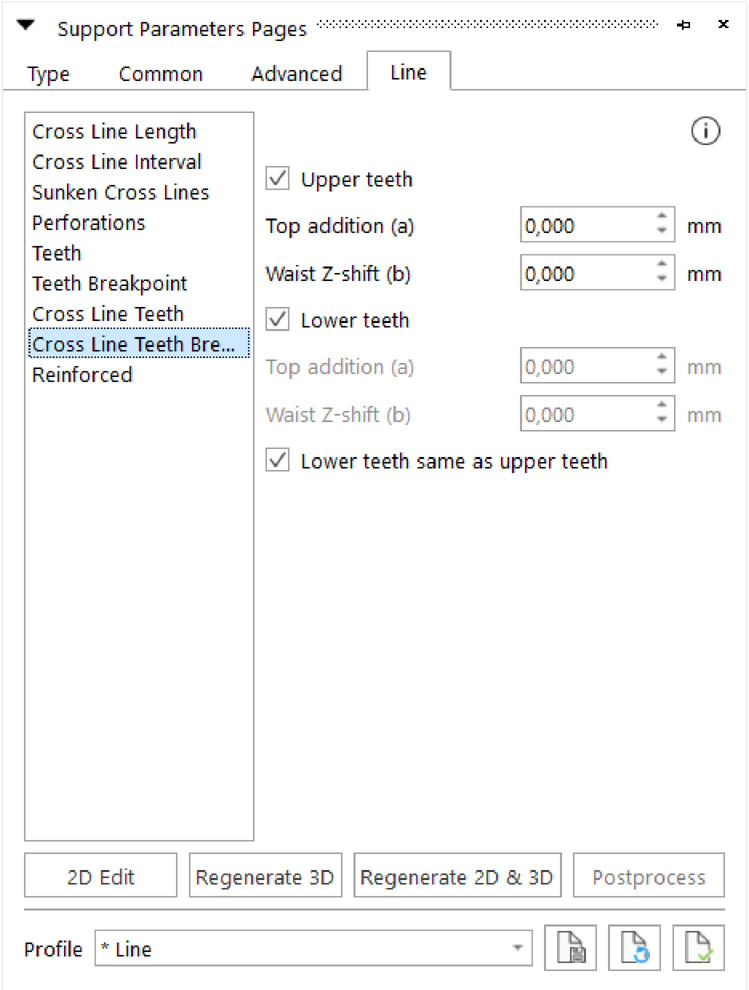


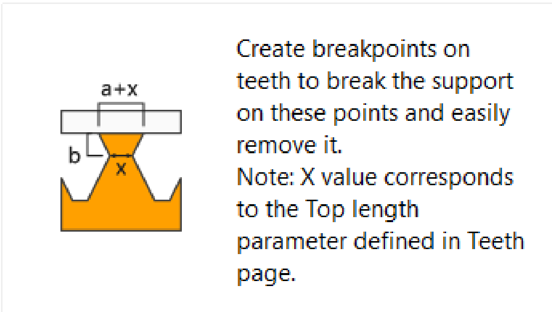



Create breakpoints on teeth to break the support on these points and easily remove it.
Note: X value corresponds to the Top length parameter defined in Teeth page.

| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

### 4.2.1.4.2 Cross line teeth breakpoint




| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |

| | | |
|---|---|---|
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

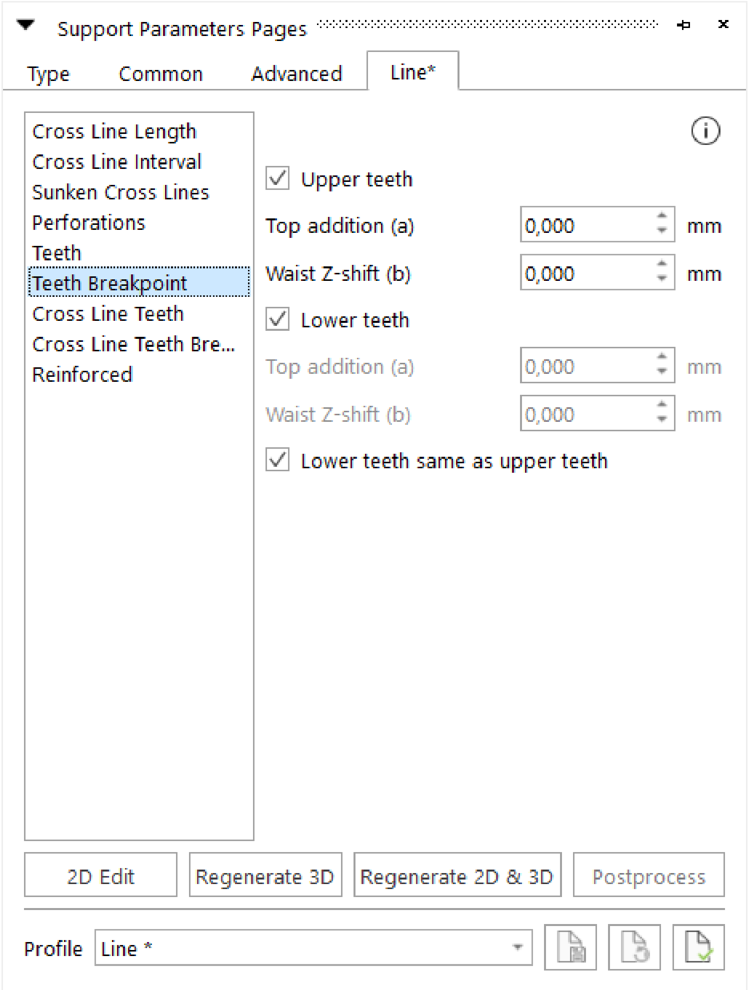
#### 4.2.1.4.3 Others

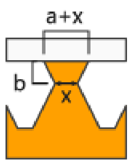
More information on the other parameters can be found within the ‘Support Generation’ module.

- See Line, page 547

### *4.2.1.5 Line**

#### 4.2.1.5.1 Teeth breakpoint

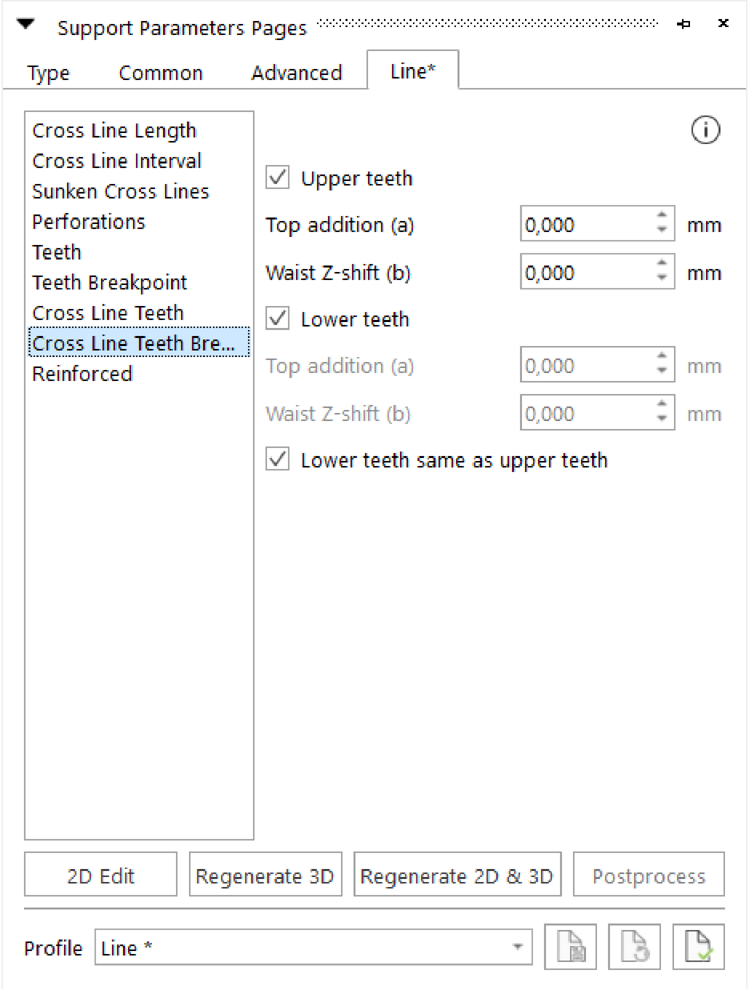


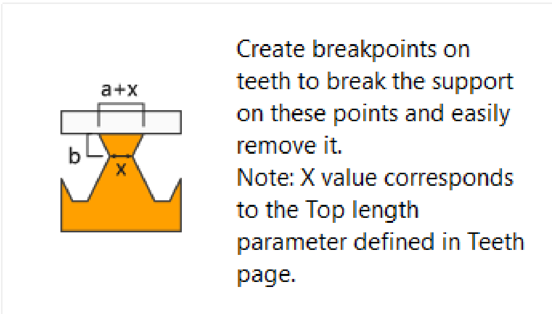



Create breakpoints on teeth to break the support on these points and easily remove it.
Note: X value corresponds to the Top length parameter defined in Teeth page.

| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

### 4.2.1.5.2 Cross line teeth breakpoint




| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |

| | | |
|---|---|---|
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

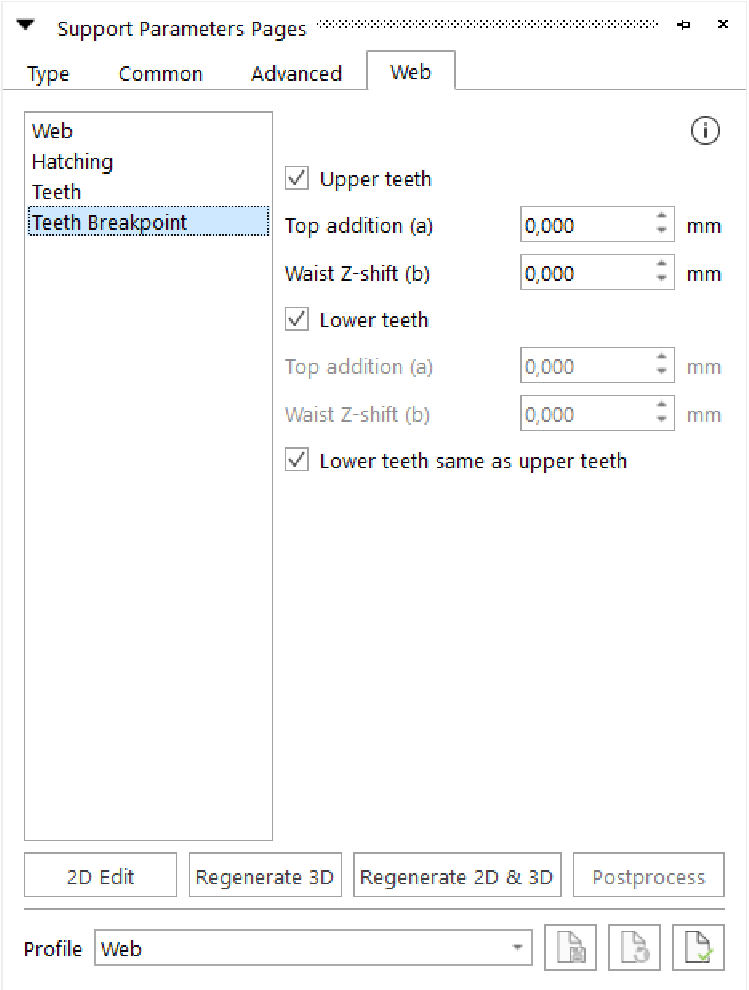
#### 4.2.1.5.3 Others

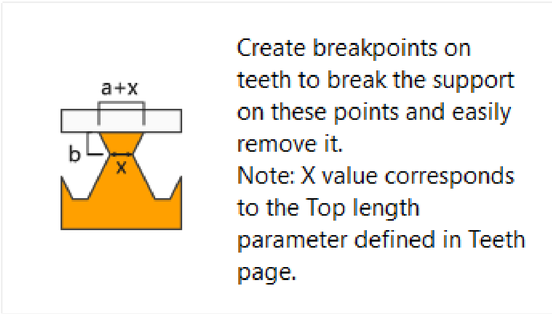
More information on the other parameters can be found within the ‘Support Generation’ module.

— See Line*, page 559

### *4.2.1.6 Web*

#### 4.2.1.6.1 Teeth breakpoint






| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

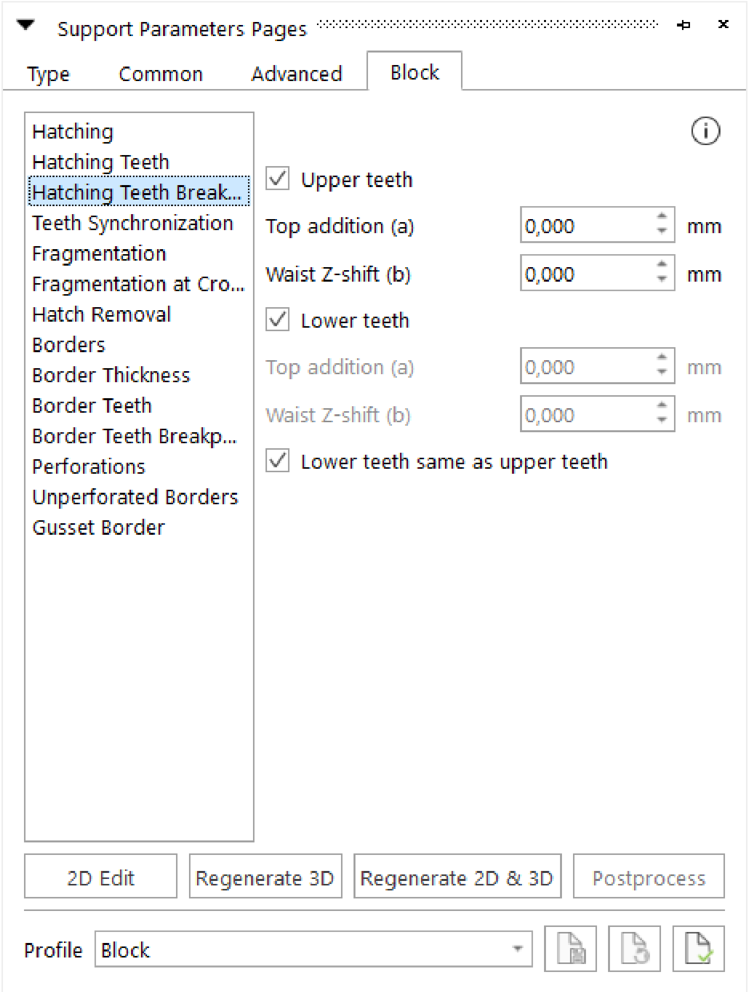
#### 4.2.1.6.2 Other

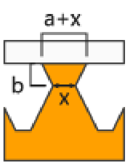
More information on the other parameters can be found within the ‘Support Generation’ module.

— See Web

### *4.2.1.7 Block*

#### 4.2.1.7.1 Hatching teeth breakpoint



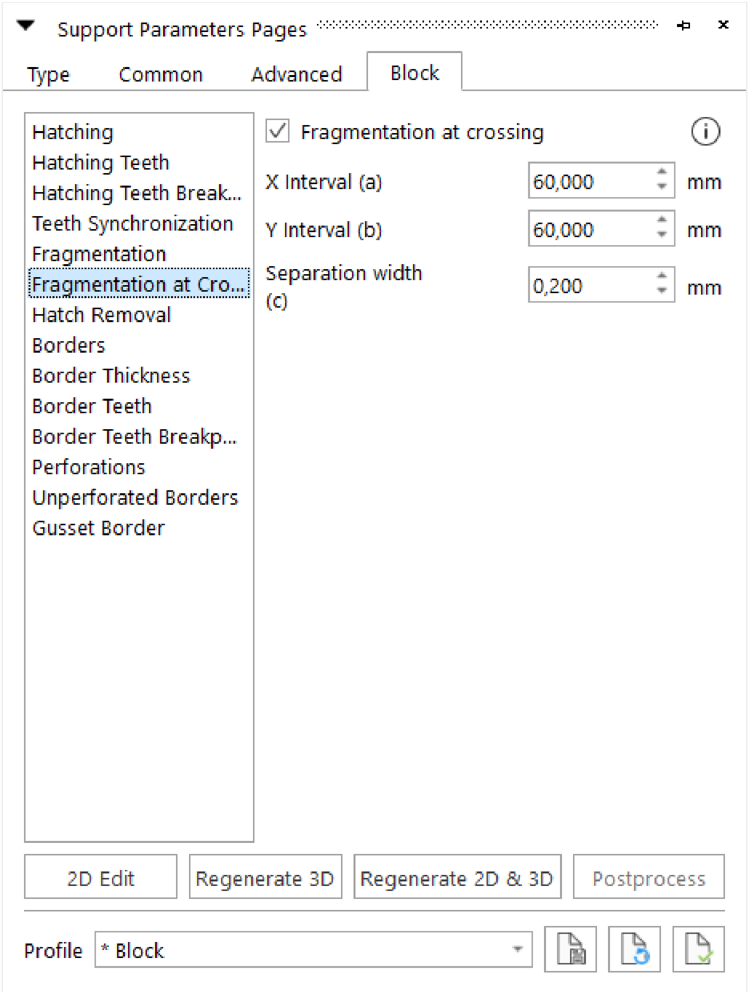



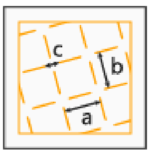

Create breakpoints on teeth to break the support on these points and easily remove it.
Note: X value corresponds to the Top length parameter defined in Teeth page.

| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |

| | | |
|---|---|---|
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

### 4.2.1.7.2 Fragmentation at crossing



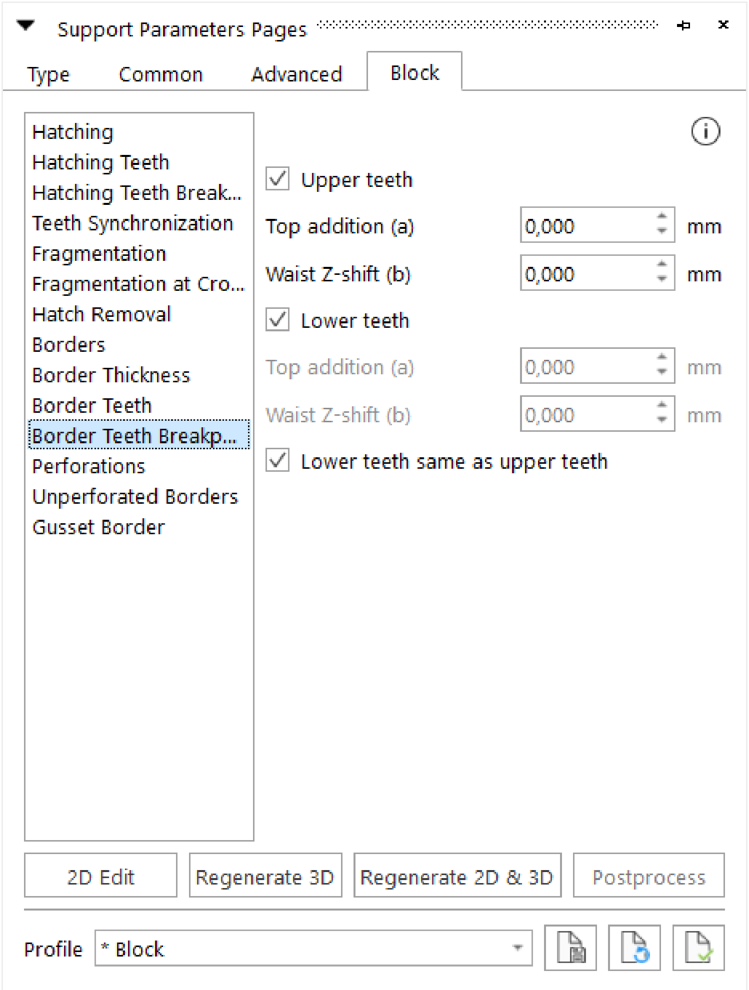



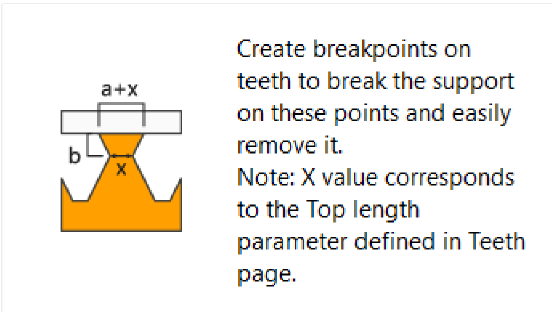

To facilitate the removal of the support, create gaps at crossing points of X an Y hatching by selecting fragmentation at crossing.

| | | |
|---|---|---|
| Fragementate at crossings | Fragmentation will leave a small gap in the hatching of the block support each chosen distance | |
| | X interval | The interval of the gaps according the X direction. |

| | | |
|---|---|---|
| | Y interval | The interval of the gaps according the X direction. |
| | Separation width | The width of the gaps in the hatching. |
| | Fragmentate borders | Check this option if you want the borders to be fragmentized too. |

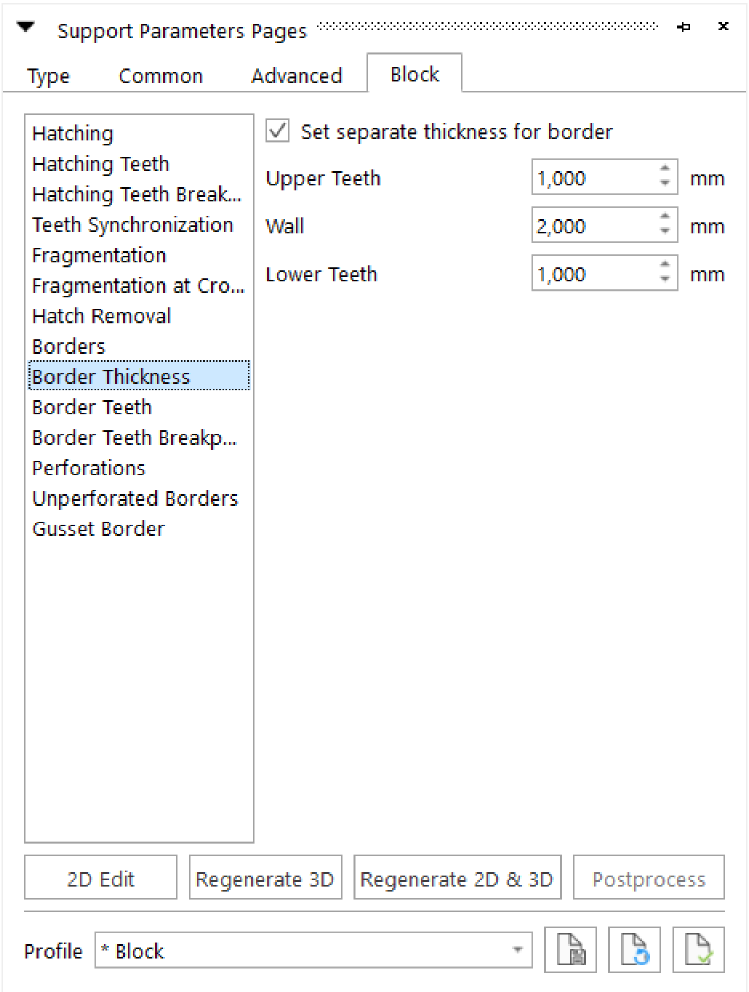
#### 4.2.1.7.3 Border teeth breakpoint



| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

### 4.2.1.7.4 Border thickness




| | | |
|---|---|---|
| Border thickness | Set a separate thickness for a non-solid border | |
| | Upper teeth | Set the thickness of the upper teeth that reach the different upper surfaces |

| | | |
|---|---|---|
| | Wall | Set the thickness of the wall in between the upper teeth and platform/ lower teeth. |
| | Lower teeth | Set the thickness of the lower teeth that touches lower surfaces. |

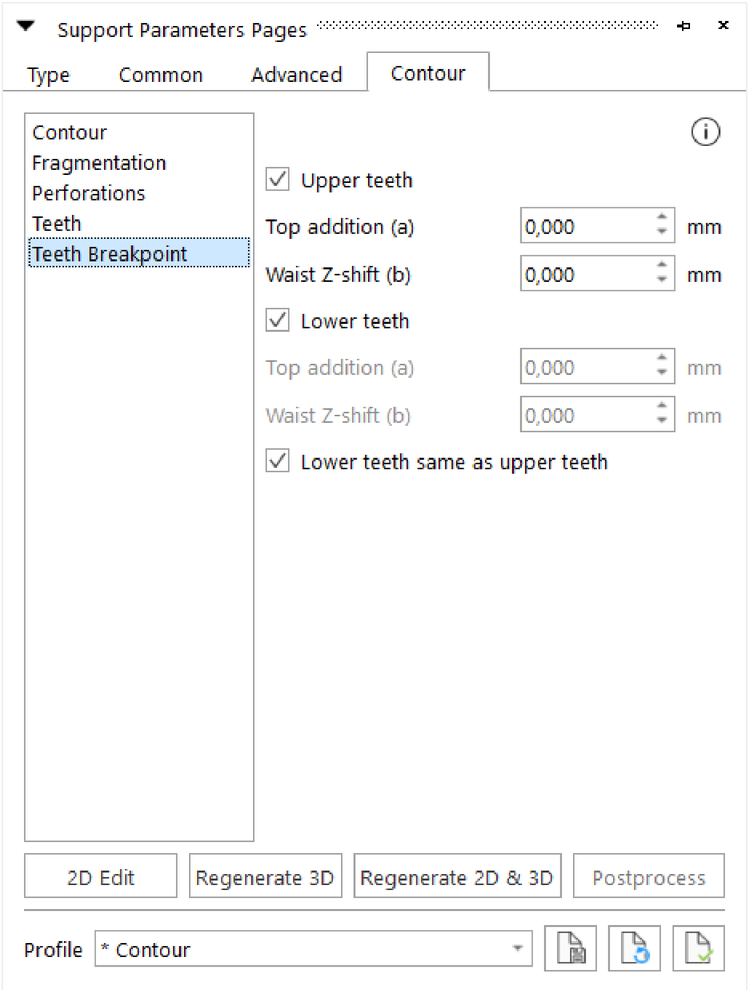
#### 4.2.1.7.5 Others

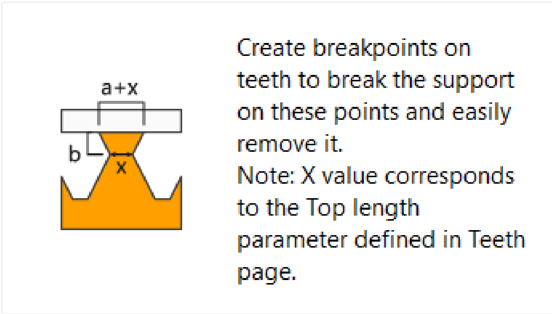
More information on the other parameters can be found within the ‘Support Generation’ module.

- See Block, page 575

### *4.2.1.8 Contour*

#### 4.2.1.8.1 Teeth breakpoint






| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

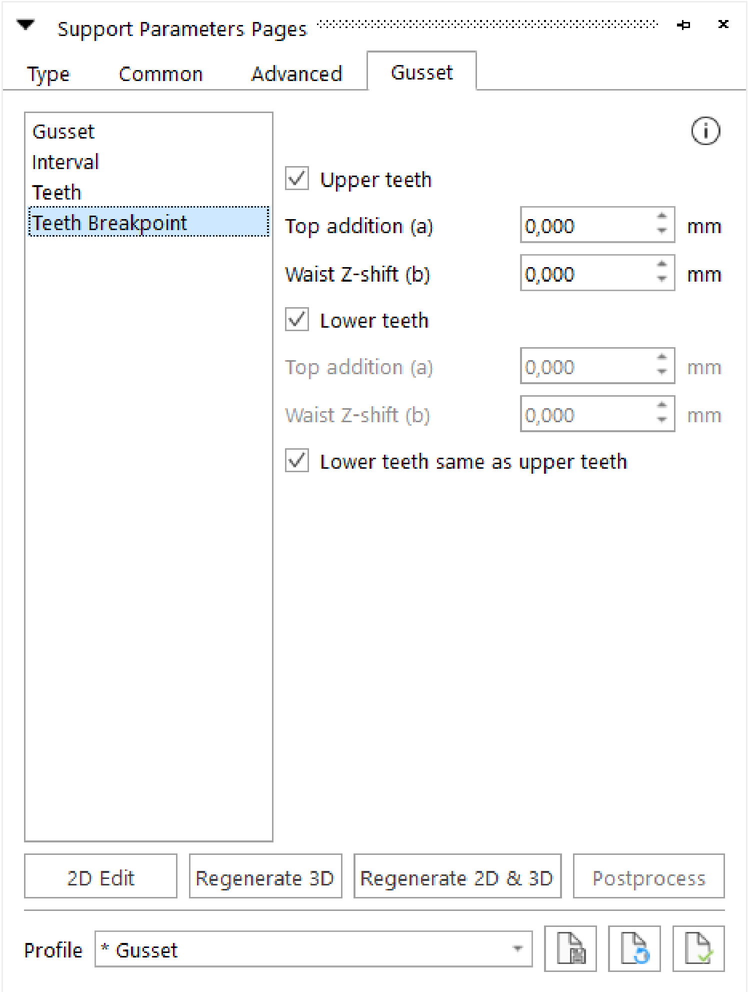
### 4.2.1.8.2 Other

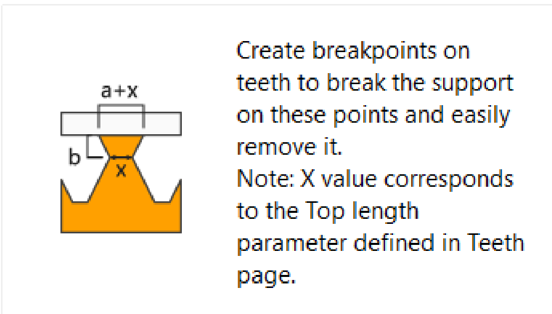
More information on the other parameters can be found within the ‘Support Generation’ module.

— See Contour, page 598

### *4.2.1.9 Gusset*

#### 4.2.1.9.1 Teeth breakpoint




| | | |
|---|---|---|
| Teeth breakpoint | Create breakpoints on teeth for easy removal | |
| | Top addition | Broaden your teeth on top.<br>Total length = Top addition + Top length |
| | Waist Z-shift | Move the breakpoint of the tooth with this parameter in the Z-direction |

| | | |
|---|---|---|
| | Lower teeth same as upper teeth | The same parameters are used for both upper and lower teeth. |

#### 4.2.1.9.2 Other

More information on the other parameters can be found within the ‘Support Generation’ module.

— See Gusset, page 605

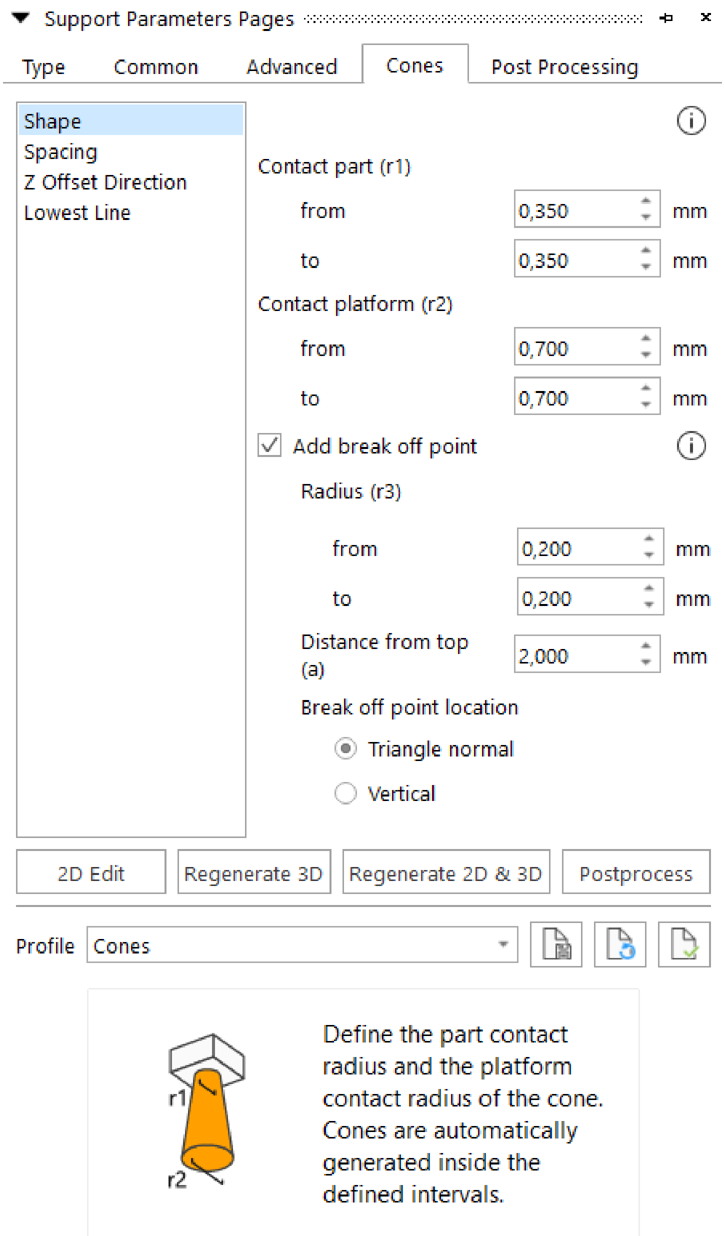
### *4.2.1.10 Volume*

More information on the other parameters can be found within the ‘Volume Support’ module.

— See Volume Support Generation Parameters, page 712

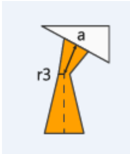
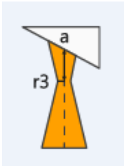
### *4.2.1.11 Cones*

#### 4.2.1.11.1 Shape

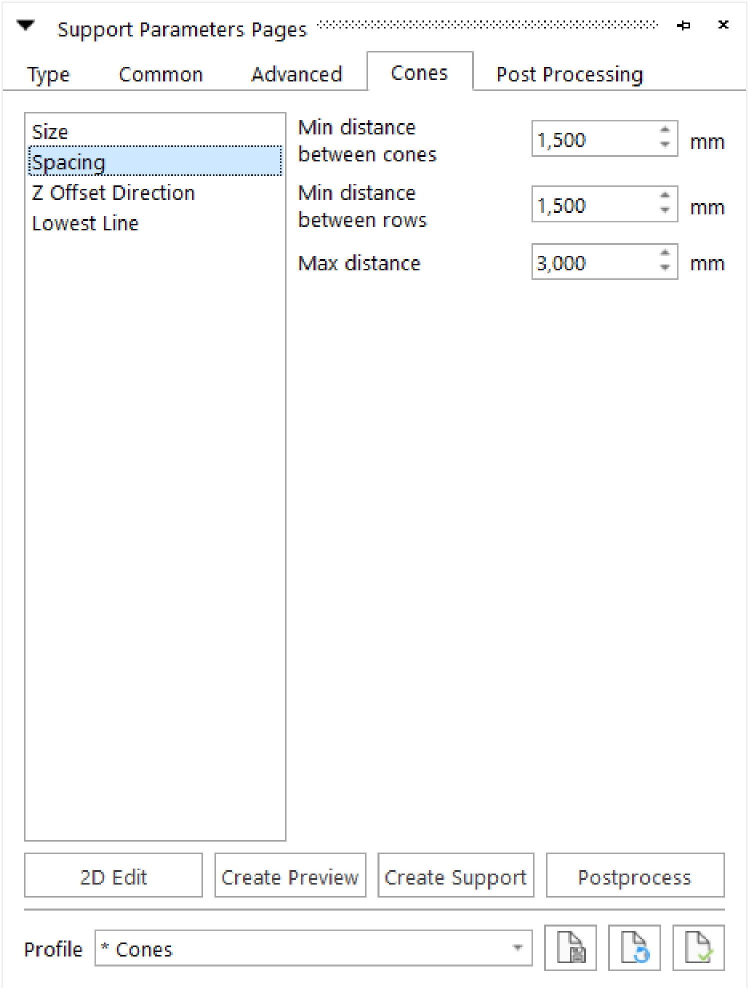



| | | |
|---|---|---|
| Shape | Contact part (r1) | Size of the cone at the part |
| | Contact platform (r2) | Size of the cone at the platform |

| | | |
|---|---|---|
| Add break off point | Add break off point at the extremity of your cone in contact with the part | |
| | Radius (r3) | Break off point diameter |

| | | |
|---|---|---|
| | Distance from top (a) | Distance between your break off point and the part |
| Break off point location | Triangle normal   | Break off point will be generated following the triangle's normal direction |
| | Vertical   | Break off point will be generated vertically |

### 4.2.1.11.2 Spacing

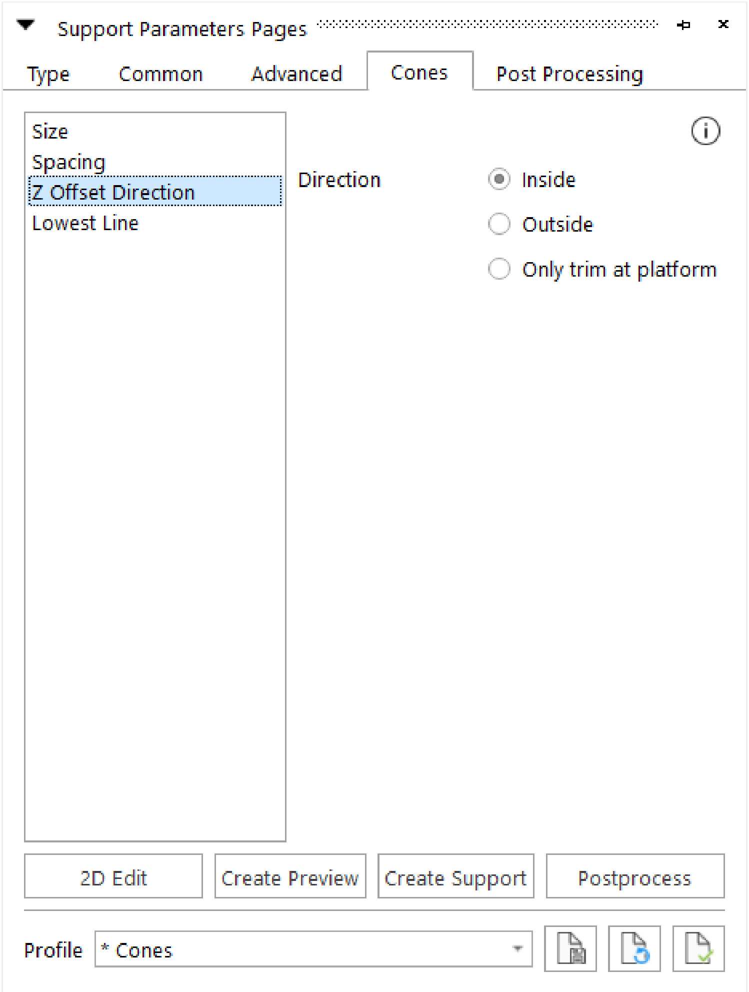


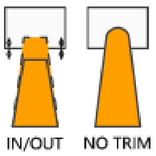

| | |
|---|---|
| Spacing | *The cones will be placed in grid determined by following parameters* |

| | | |
|---|---|---|
| | Min distance between cones | Space between cones |
| | Min distance between rows | Space between the rows |
| | Max distance between cones | Maximum distance between cones. |

Furthermore the algorithm takes into account 'XY Offset' and 'Z Offsets' of the Common page.

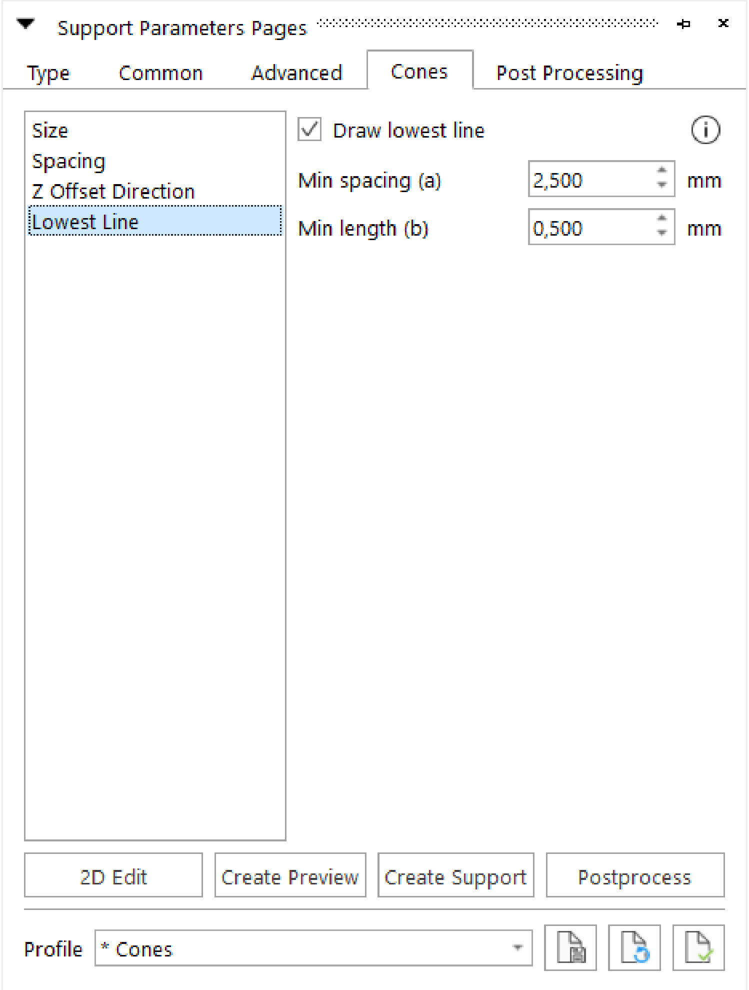
### 4.2.1.11.3 Z Offset Direction

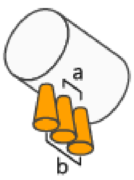





Define the direction of the Z offset: select inside to penetrate the part or outside to create a gap between the part and the support. With Only trim at platform option, the cone tip is not trimmed and penetrates the part.

### 4.2.1.11.4 Lowest Line



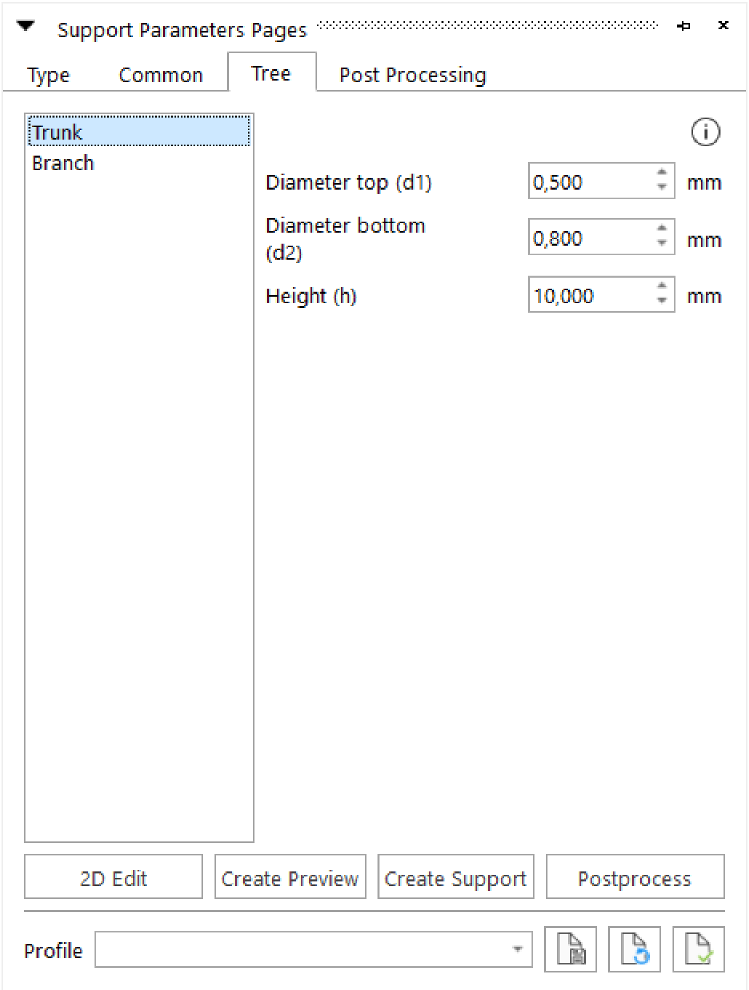



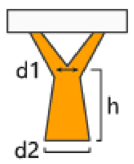

Automatically generate an extra line of support to ensure the lowest line (the imaginary line connecting the lowest points of the surface) is supported.

| | | |
|---|---|---|
| Draw lowest line | When placing a support under a curved surface, it can happen that the lowest line (= the imaginary line connecting the lowest points of the surface) is not supported correctly. This can cause problems when building the part with some RP-techniques. When lowest line is checked, an extra line of support will be placed so that this lowest line is correctly supported. | |
| | Minimal spacing | Defines the minimal spacing between the cone centers along the lowest line. |
| | Minimum length | Lowest lines smaller then this value (length) will be filtered out |

### *4.2.1.12 Tree*

#### 4.2.1.12.1 Trunk

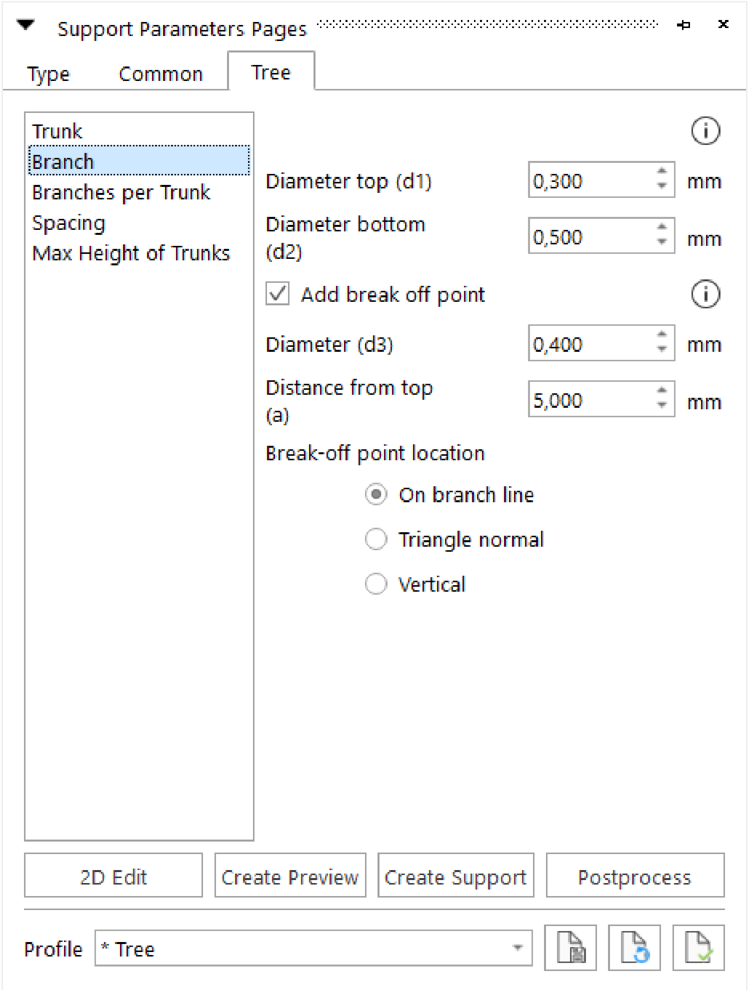


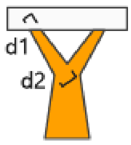



Define the trunk top diameter and the trunk bottom diameter. Height is only used in manual trees.

| | |
|---|---|
| Trunk | Defines tree support trunk parameters |
| Diameter top (d1) | Diameter of the trunk at the top |
| Diameter bottom (d2) | Diameter of the trunk at the bottom |
| Height (h) | Height of your trunk |

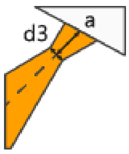
## 4.2.1.12.2 Branch





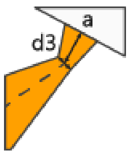

Define the branch top diameter and the branch bottom diameter.

| | |
|---|---|
| Branch | Defines tree support branch parameters |
| Diameter top (d1) | Diameter of the branch at the top (where connected to the part) |
| Diameter bottom (d2) | Diameter of the branch at the bottom (where connected to the trunk) |



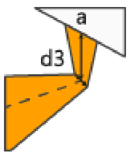

**On branch line**

To facilitate the support removal, add a break off point where the branch connects to the part. With On branch line option, the break off point follows the same line that connects the branch to the part.




**Triangle normal**

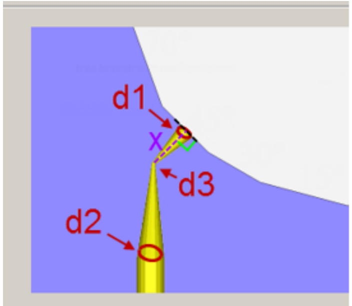
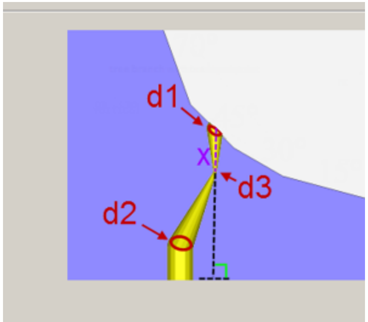
With Triangle normal option, the break off point follows the direction of the part triangle normal.



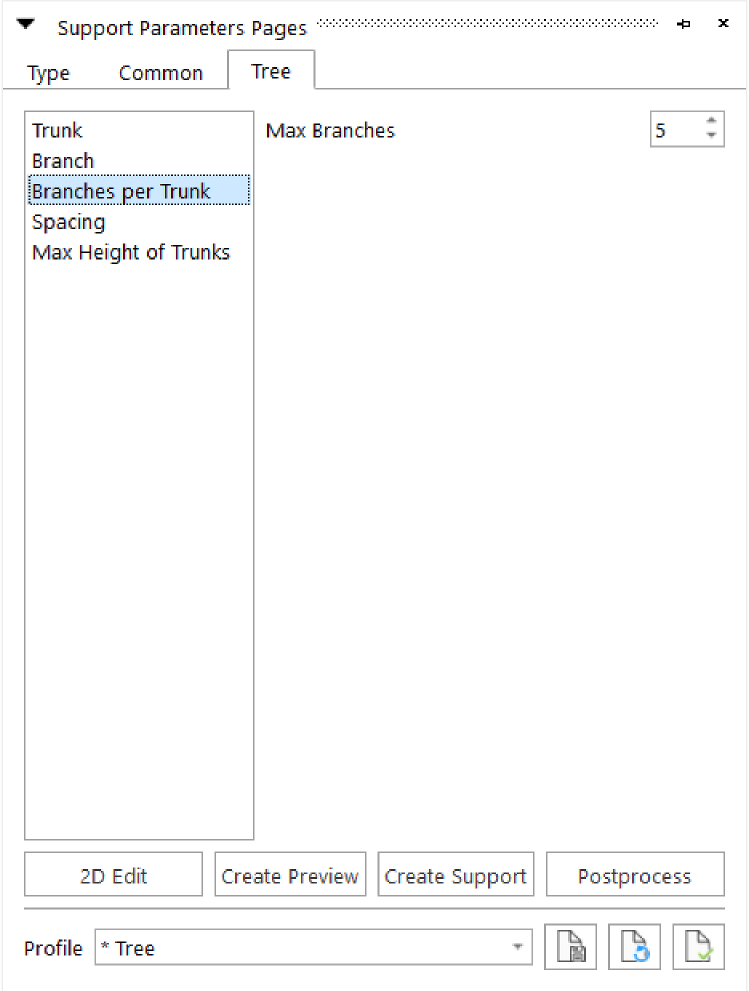

**Vertical**

With Vertical option, the break off point follows the Z direction.

| | | |
|---|---|---|
| Add break-off point | Add break off point at the extremity of your branch in contact with the part | |
| | Diameter (d3) | Break off point diameter |
| | Distance from top (x) | Distance between your break off point and the part |
| Break-off point location | On branch line | Break off point will be generated on the same line connecting branch to the part |

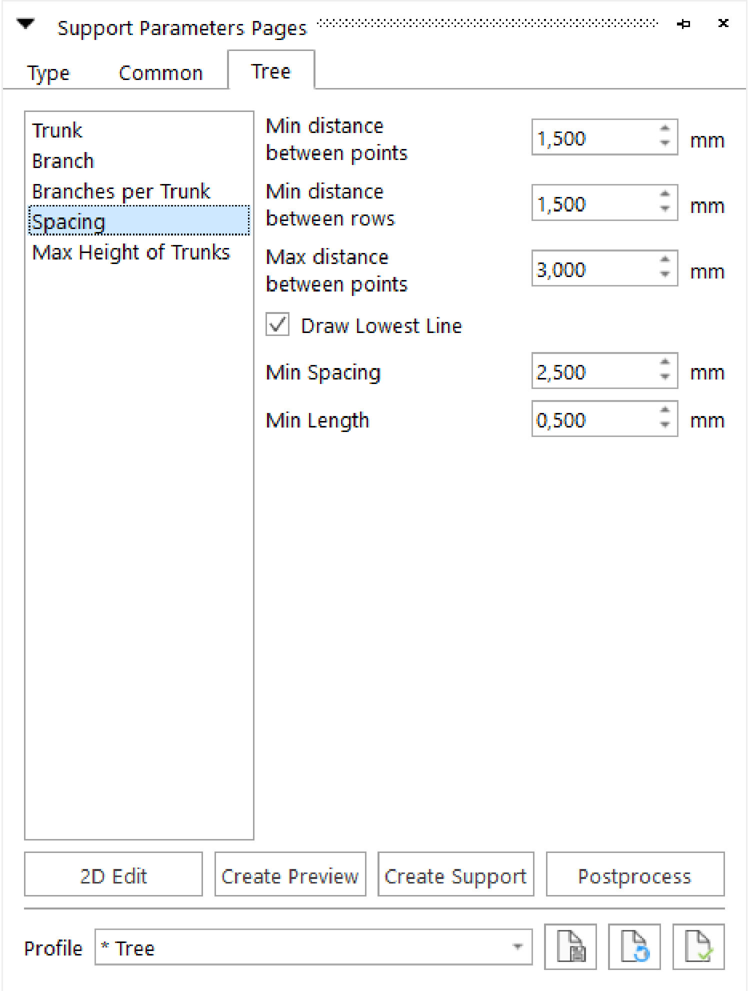
| | | |
|---|---|---|
| | Triangle normal   | Break off point will be generated following the triangle's normal direction |
| | Vertical   | Break off point will be generated vertically |

### 4.2.1.12.3 Branches per Trunk




| | |
|---|---|
| Max branches per trunk | Defines the maximum amount of branches that can be created per trunk |

### 4.2.1.12.4 Spacing

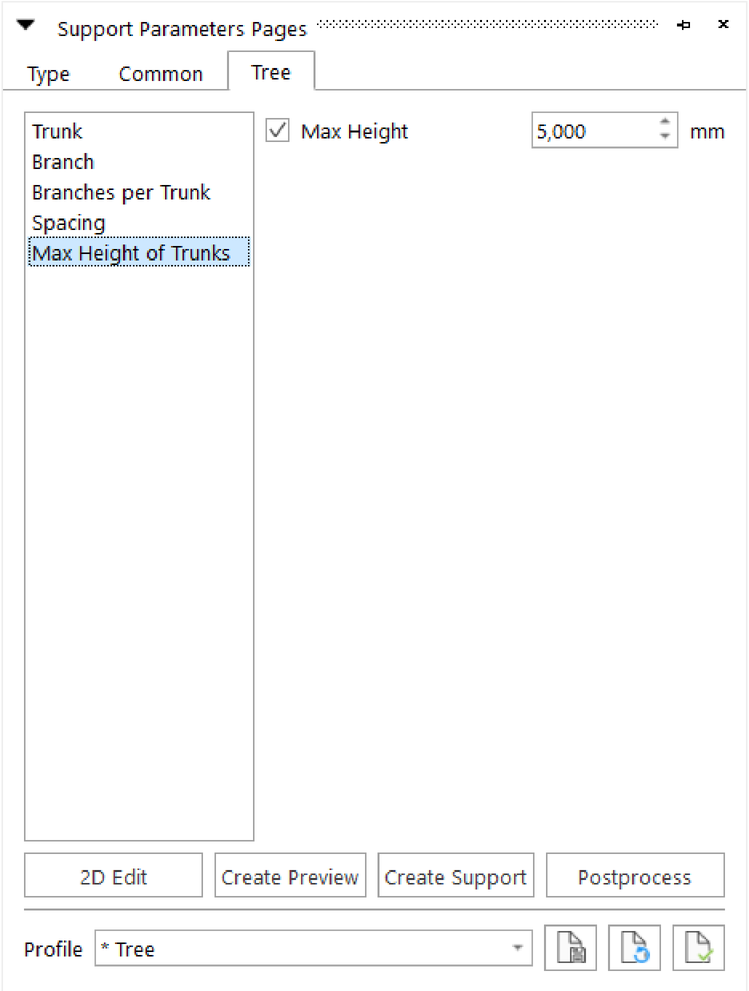



These are the same parameters as used in cone supports.

| | |
|---|---|
| Min distance between connection points | Space between connection points |
| Min distance between rows | Space between rows of connection points |
| Max distance between connection points | The maximum space between connection points |
| Draw Lowest Line | When placing a support under a curved surface, it can happen that the lowest line (= the imaginary line connecting the lowest points of the surface) is not supported correctly. This can cause problems when building the part with some RP-techniques. When lowest line is checked, an extra line of support will be placed so that this lowest line is correctly supported. |
| Minimal spacing (a) | Defines the minimal spacing between the connection points along the lowest line. |

| | |
|---|---|
| Minimum length | Lowest lines smaller then this value (length) will be filtered out |

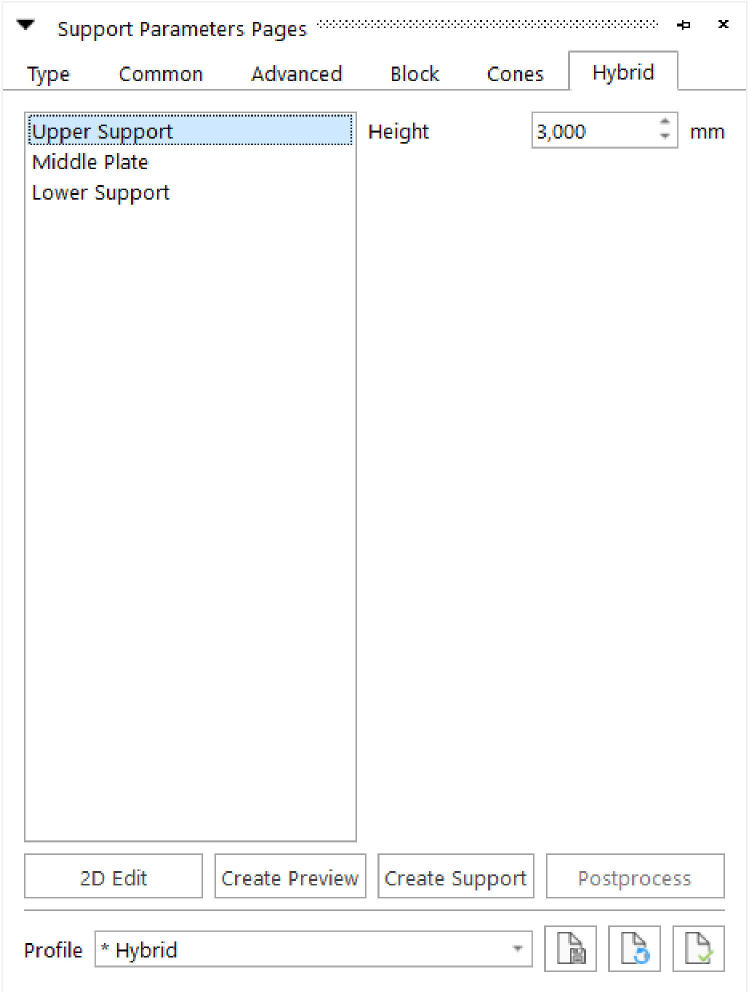
### 4.2.1.12.5 Max Height of Trunk




| | |
|---|---|
| Max height of trunks | If checked, the maximum height of trunks will be limited by the entered value. |

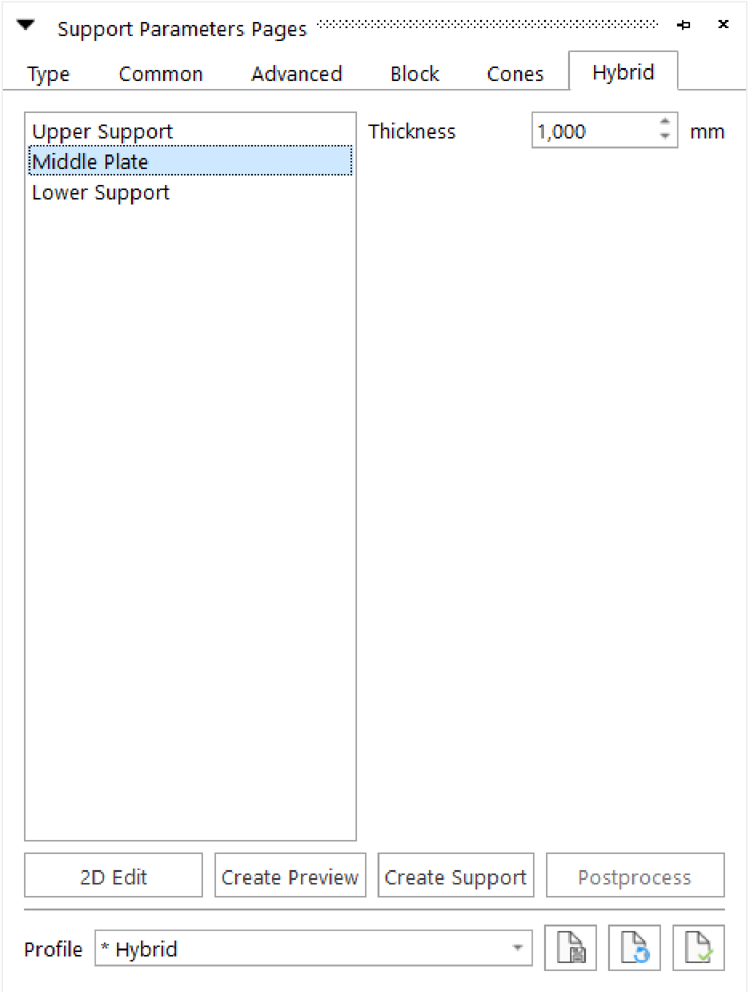
### *4.2.1.13 Hybrid*

#### 4.2.1.13.1 Upper support



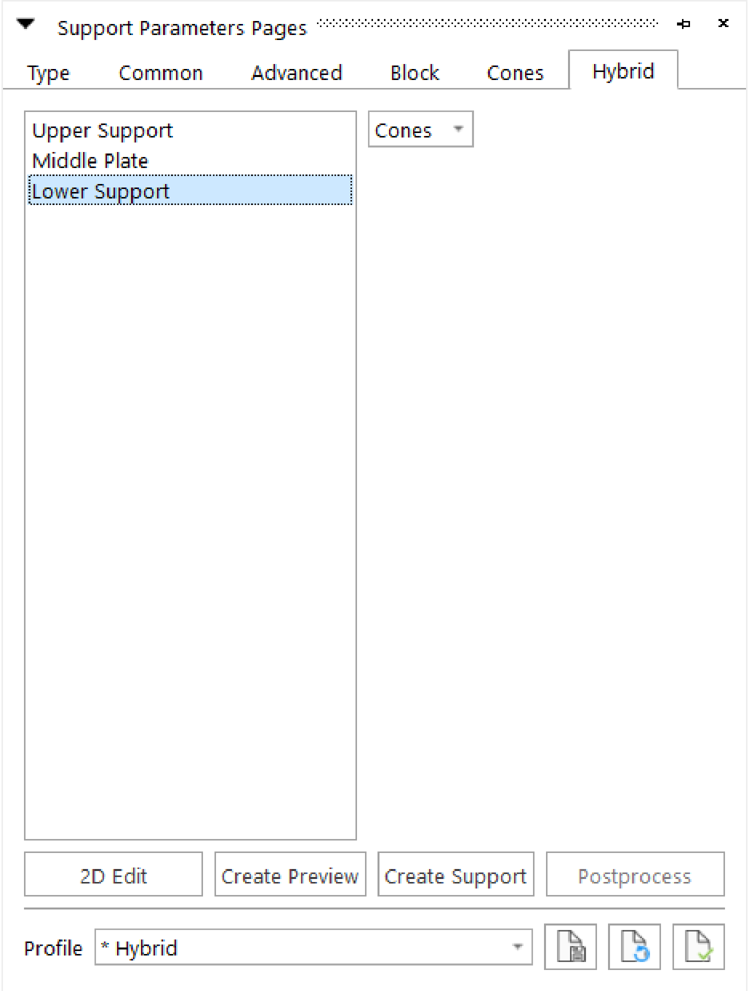

| | |
|---|---|
| Upper support height | Defines the height of the upper part of the hybrid support structure |

### 4.2.1.13.2 Middle plate




| | |
|---|---|
| Middle plate thickness | Defines the height of the middle part of the hybrid support structure |

#### 4.2.1.13.3 Lower support




| | |
|---|---|
| Cones | The lower part of the support structure consists of cones |
| Trees | The lower part of the support structure consists of trees |

## 4.3 Modifying surfaces, support and parameters

More information can be found under the ‘Support Generation’ module.

— See Chapter 3: Support Generation, page 506

## 4.4 Support Toolbox

### 4.4.1 Type Toolpage

More information can be found under the ‘Support Generation’ module.

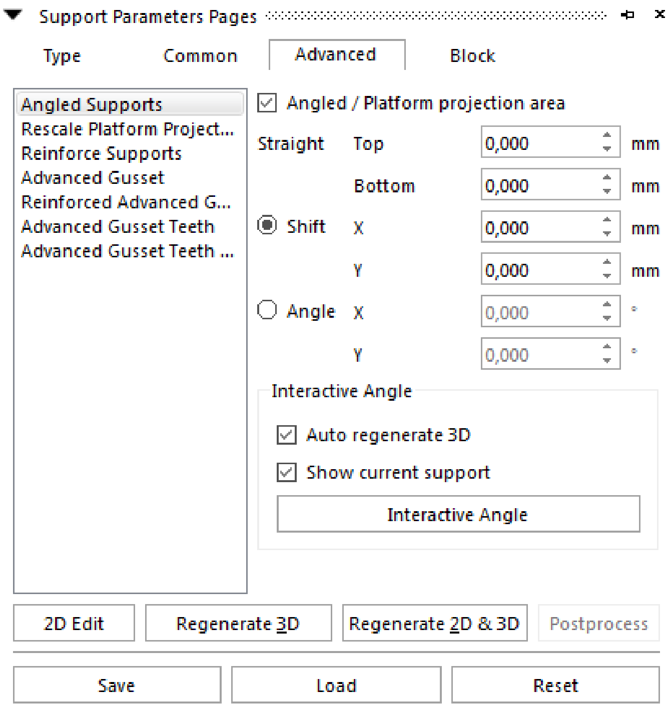

— See
— Type Toolpage, page 635


### 4.4.2 Common Toolpage

More information can be found under the ‘Support Generation’ module.


— See Common Toolpage, page 636


### 4.4.3 Advanced Toolpage



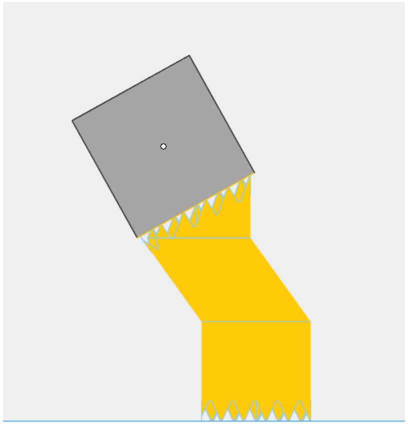

Detailed explanation on the advanced parameters can be found at the advanced support parameters from the machine properties.

### 4.4.3.1 Angled support

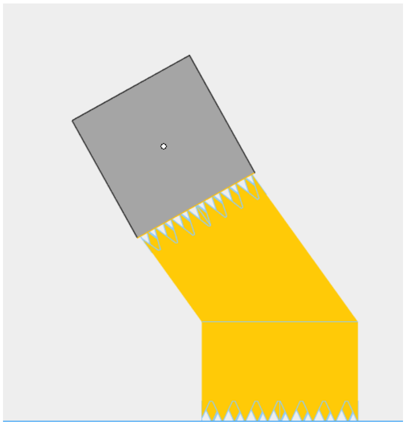
#### 4.4.3.1.1 Angled support types

There are two types of angled support available:

- Vertical angled support: Support will be angled starting from the lowest point of the surface or from a defined distance from this lowest point.

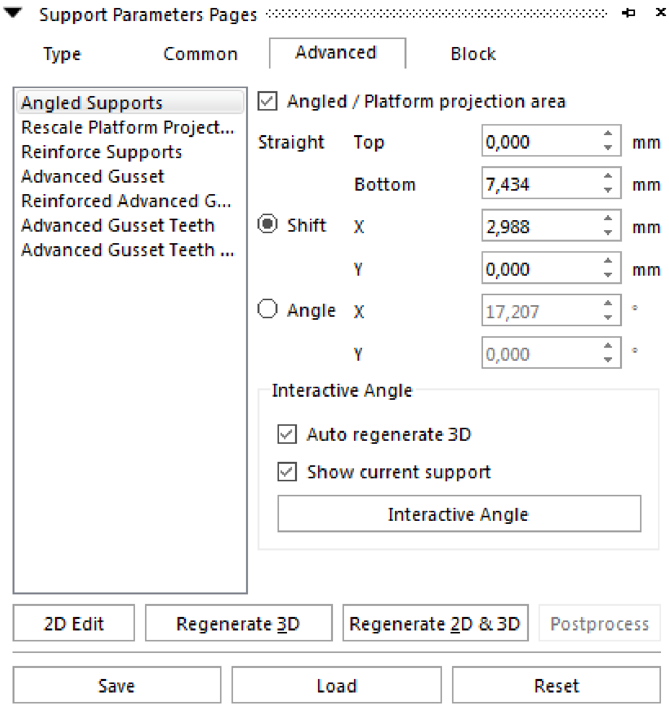


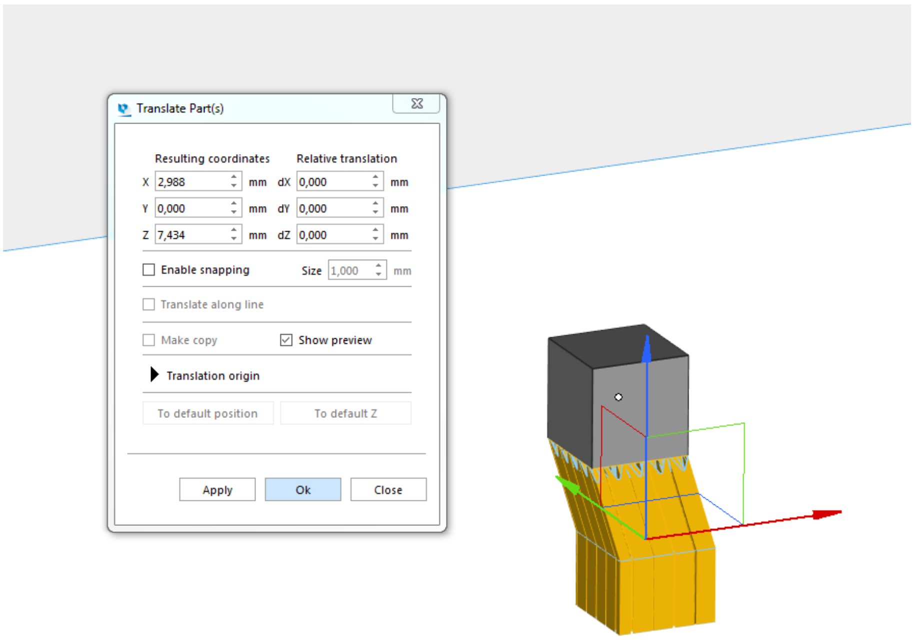
- In-line angled support: Support will be angled from the connection point with the part.



#### 4.4.3.1.2 Interactive Angle

To create an angled support interactively, you have to click on the ‘Interactive Angle’ button. Next you can click on an axis of the gizmo and drag to move the support along that axis. It is also possible to click on a plane of the gizmo to move the support within that plane.

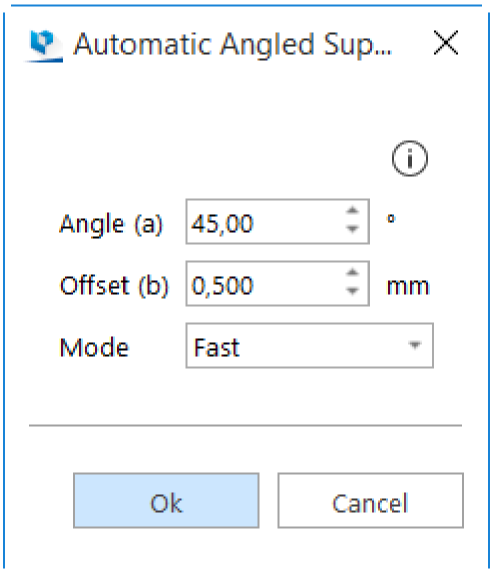


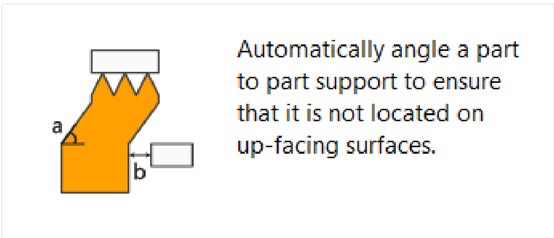




| | |
|---|---|
| Auto regenerate 3D | The support will be automatically regenerated when you release the gizmo. |
| Show current support | The current support will always be visible during the translation of the support. |
| Interactive Angle | Starts the Interactive Angle functionality. |

### 4.4.3.1.3 Automatic angle

The automatic angle can be used to automatically angle Part to part supports.



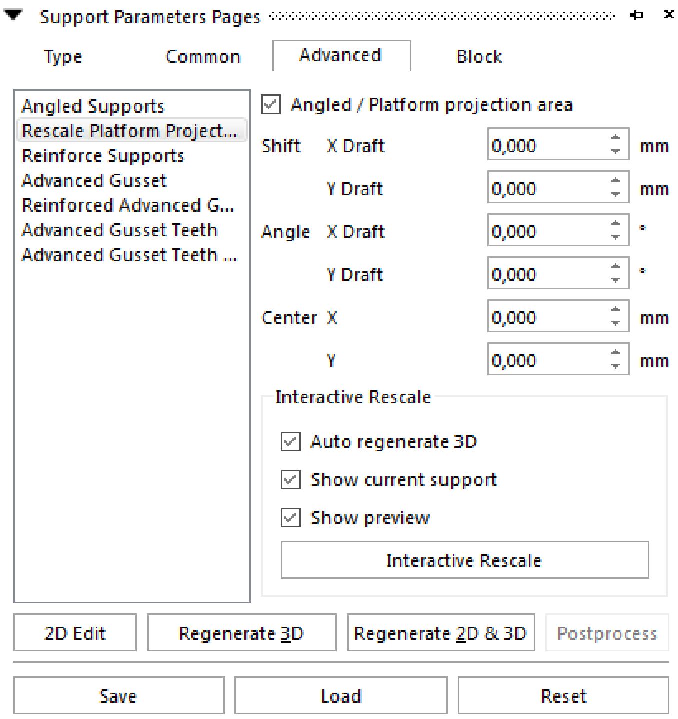



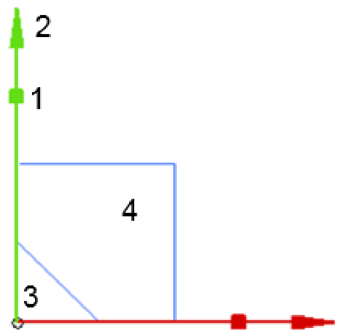

| | |
|---|---|
| Angle | The maximum angle between the support and the horizontal plane. This angle is used to ensure that the support is self-supporting. |
| Offset | The minimal distance between the support and the part. This parameter can be used to avoid the fusing of part and support during printing. |
| Mode | The mode determines the speed and the accuracy of the algorithm. |

### *4.4.3.2 Interactive Rescale*

To rescale the platform projection interactively, you have to click on the 'Interactive Rescale' button. Depending on which element of the gizmo you click and drag, you will either change the rescale shifts or move the rescale center. When you click and drag on:

- A square on the axis (1), the rescale shift will change in the direction of the axis.
- The arrow on the axis (2), the rescale center will move along that axis.
- The area within the triangle (3), a uniform rescale shift will be applied.
- The area within the blue square (4), the rescale center will move in the XY plane.



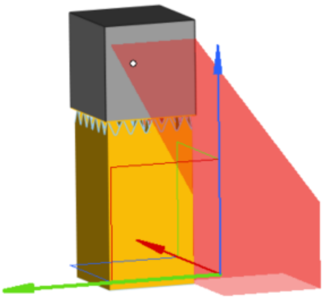




| | |
|---|---|
| Auto regenerate 3D | The support will get automatically regenerated when you release the gizmo. |
| Show current support | The current support will always be visible during the rescaling of the support. |
| Show preview | A preview of the rescaled support will be shown. |
| Interactive Rescale | Starts the Interactive Rescale functionality. |

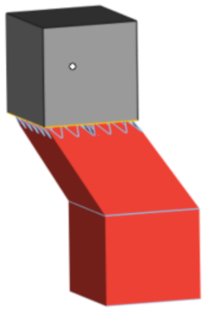
### *4.4.3.3 Mark non-self-supporting*

When the max angle of a support exceeds the “Surface angle” parameter (defined in Machine Properties), the color of this support will be red. The red color is only visible as long as the support is selected.

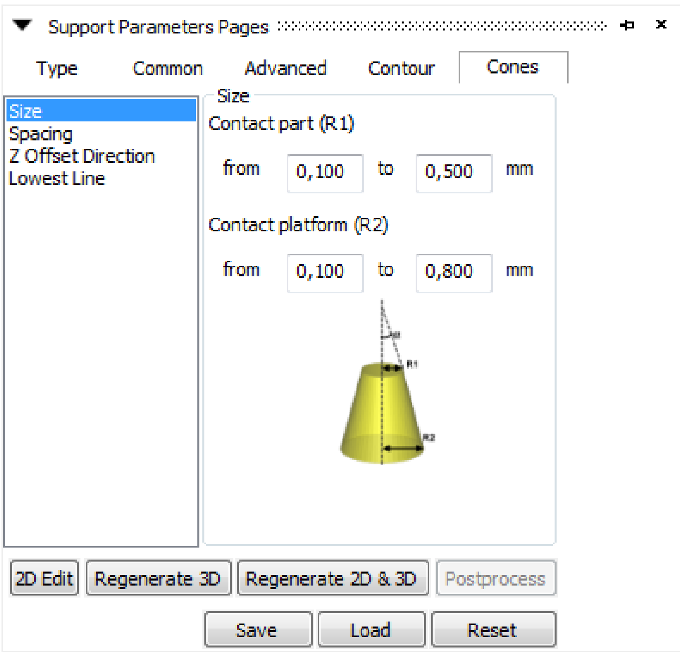
Real time preview



Actual support



## 4.4.4 Cones Toolpage

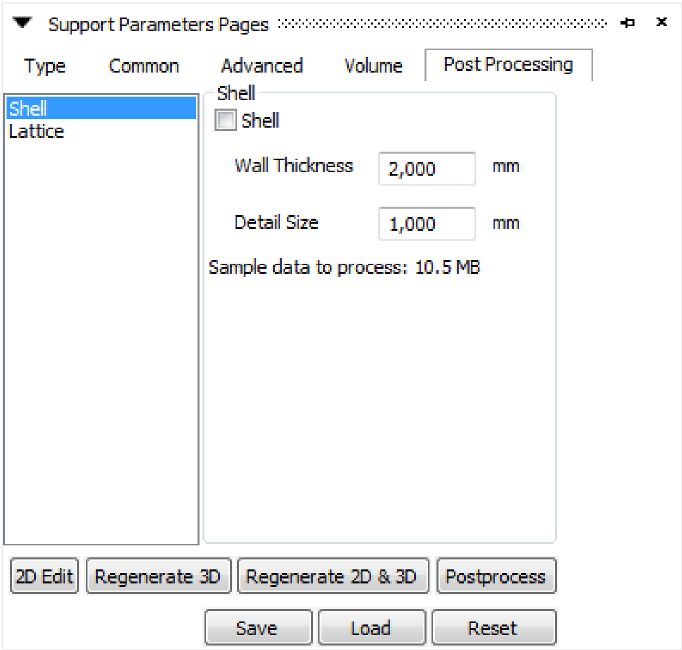



Detailed explanation on the line parameters can be found at the cones support parameters from the machine properties.

### 4.4.5 Post Processing Toolpage

This page offers several tools to position and hollow supports, or even to convert supports to a lattice structure. Depending on the type of support that is selected certain of the tools can be used.

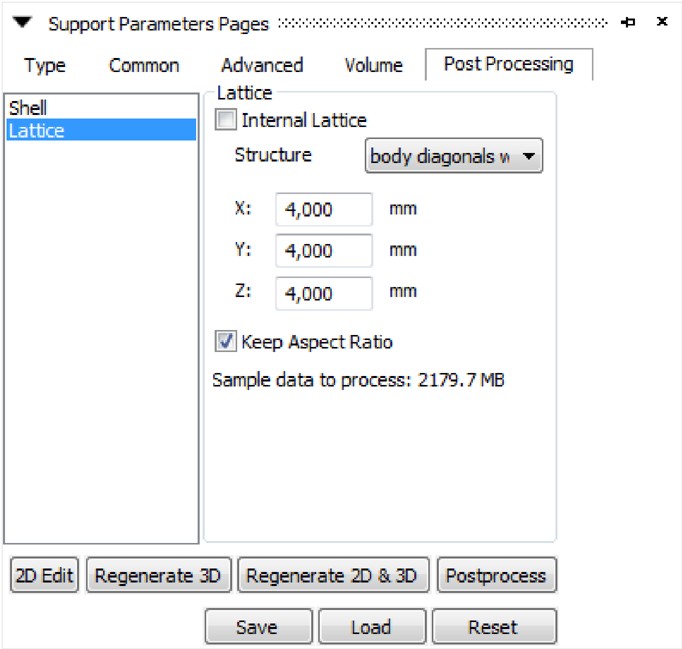
- Shell




| | | |
|---|---|---|
| Shell | When selected the support will be hollowed an receive a shell | |
| | Wall Thickness | Thickness of the shell |
| | Detail Size | Allowed deviation for the wall thickness |
| | Sample data to process | Amount of memory necessary to perform this hollow operation |

Only for solid supports the users will have the ability to perform a hollow operation. Naturally non-solid supports such as block, line, … supports cannot be hollowed.

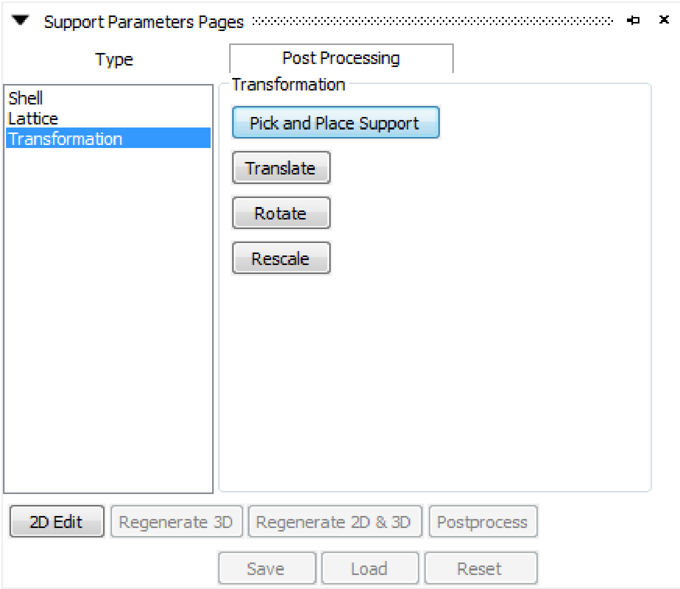
- Lattice




| | | |
|---|---|---|
| Internal lattice | When selected the support will be converted to a lattice | |
| | Structure | The list shows the library of unit structures that can be used to create the lattice. The location of the library is given in your settings. One can manually add new structures to be used for the lattice creation |
| | X | Size of unit structure in X direction |
| | Y | Size of unit structure in Y direction |
| | Z | Size of unit structure in Z direction |
| | Sample data to process | Amount of memory necessary to perform this hollow operation |

Just as for the hollow operation one can only convert solid supports to a lattice. If one checks ‘shell’ as well as ‘lattice’ the support will receive a shell and internally the lattice.

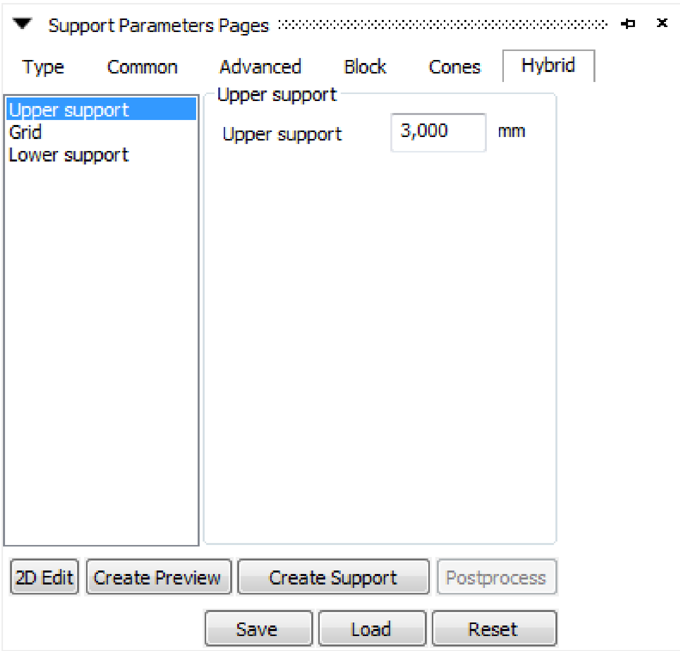
— Transformation




This option will only be visible for imported supports and for manually generated cones. After all, other supports are linked to part surfaces and should remain on these positions.

For information on the ‘Pick and Place Support’, ‘Translate’, ‘Rotate’ and ‘Rescale’ please check out the Tools Menu.

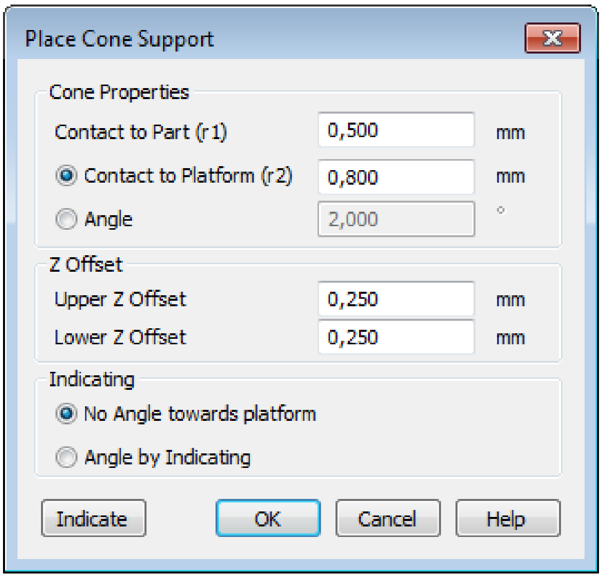
### 4.4.6 Hybrid Toolpage



## 4.5 3D editing of supports

### 4.5.1 Create cone support manually

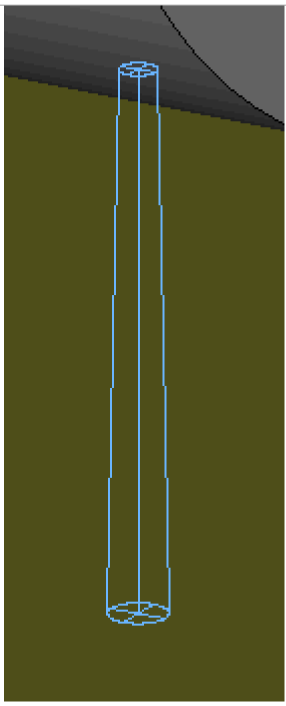
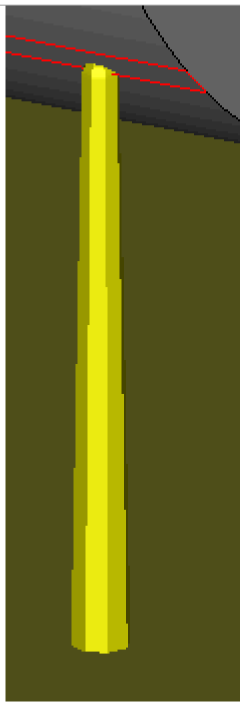
Furthermore there is the option to manually generate cones going straight down to the platform, or underneath an angle. For placing cones that go straight down to the platform the user should just indicate a point on the surface. For generating angled cones, the user should select 2 points.

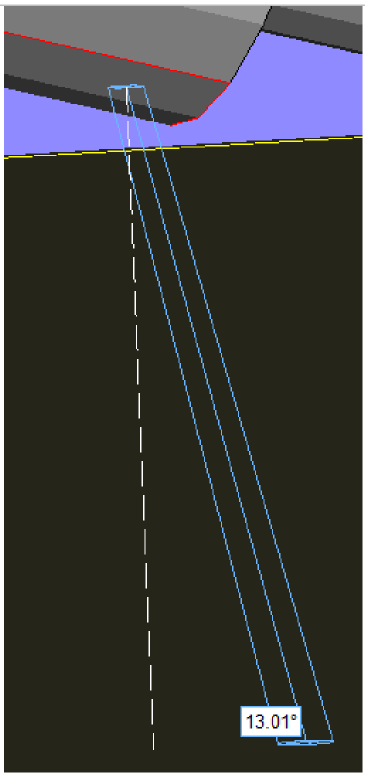
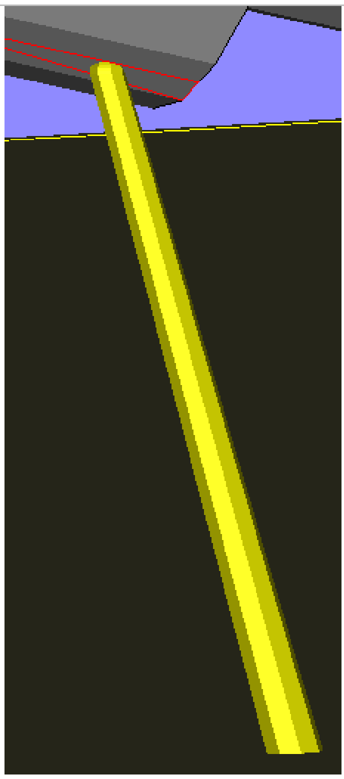



| | | |
|---|---|---|
| Size | Contact to Part | Radius of the cone at the part |
| | Contact to Platform | Radius of the cone at the platform |
| | Angle | angle of the cone |
| | *Notification*: either 'Contact to Platform' or 'Angle' can be edited. The other should adapt. | |
| Z Offset | | |
| | Upper Z Offset | Offset of the upwards facing surfaces |
| | Lower Z Offset | Offset of the downwards facing surfaces |
| Indicating | No Angle towards platform | As soon as you indicate one point on the part a cone will be generated going straight down to the platform |
| | Angle by Indicating | Two points need to indicated; like this the cone can receive different angles towards the platform |

#### 4.5.1.1 *Cone preview*

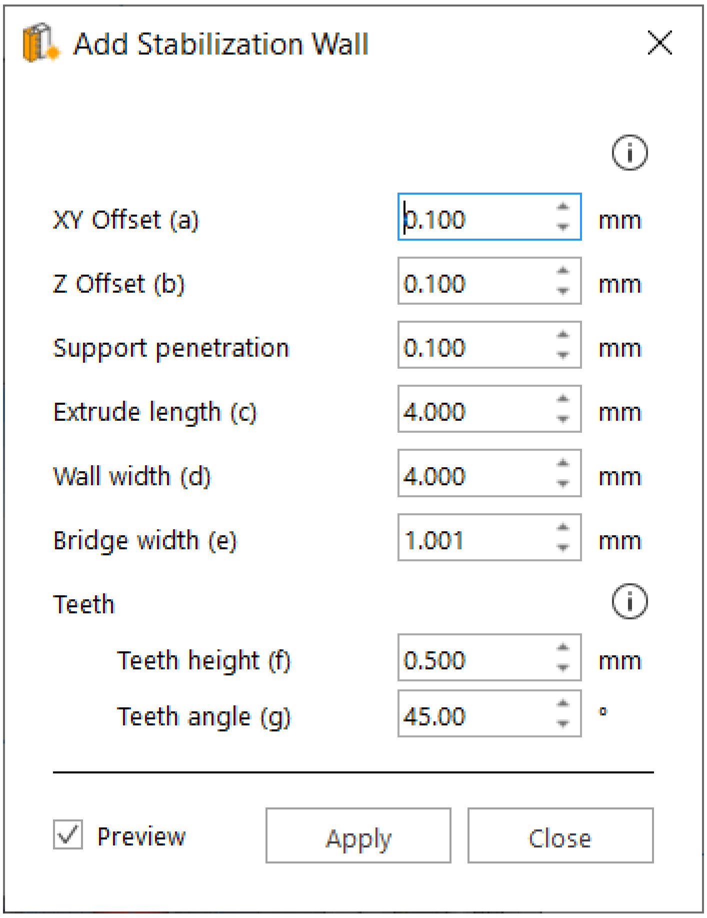
While creating cones manually, a preview of the cone will be displayed. The preview makes it easier to define the correct placement of the cone and shows immediately how the support will look. The principle of WYSIWYG (What you see is what you get) is applied here.

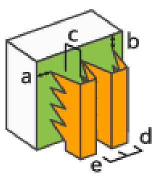
| No angle towards platform | |
|---|---|
| Preview Cone | Cone |
|  |  |

| Angle towards platform (by indication) | |
|---|---|
| Preview Cone | Cone |
|  |  |

### 4.5.2 Stabilization Wall

The user can add a vertical support wall to support thin and tall parts during FDM printing process

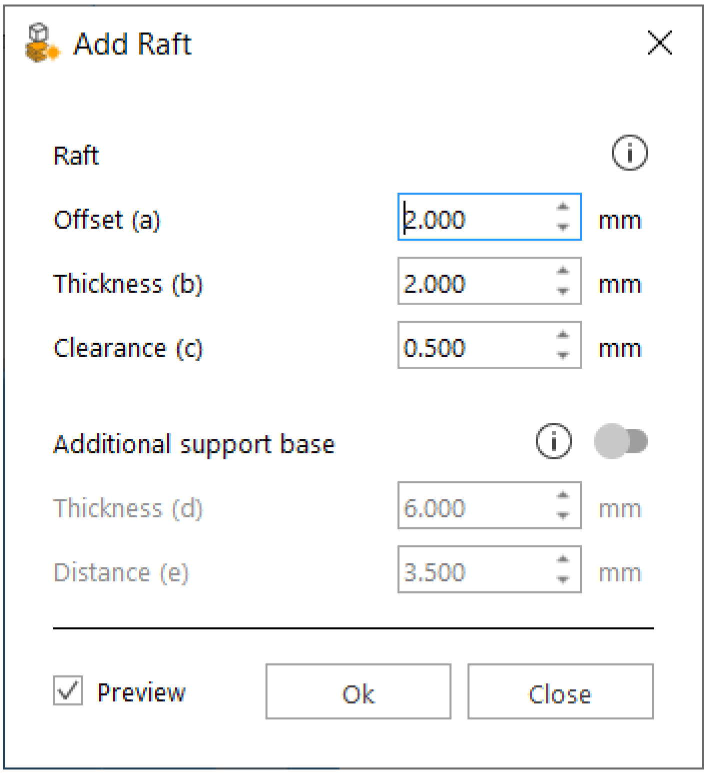


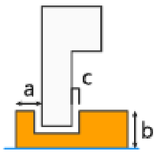




Vibrational forces within the machine can affect large, thin parts and may lead to dimensional inaccuracies. Mark the desired surface and add a stabilization wall to prevent it.

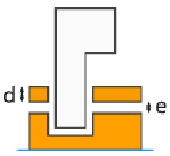
### 4.5.3 Add Raft

The user can add smear raft under the support in 3D



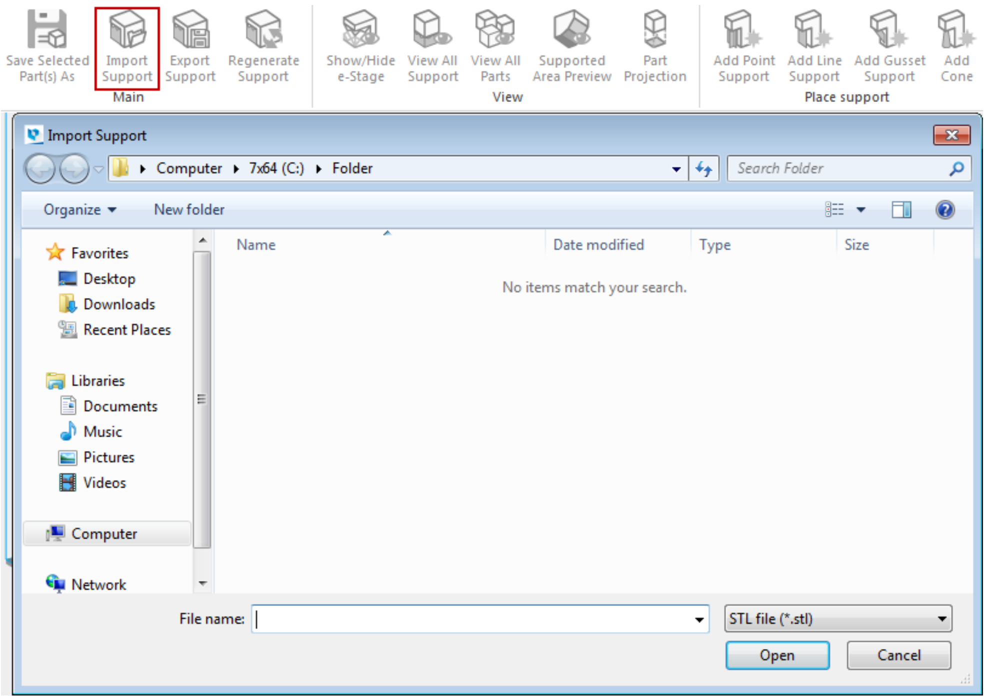




Generate a raft below the support and attached to the platform to prevent the part from smearing. Define the raft shape, the thickness and the clearance from the part.




Add an additional support plate to establish a stable base for sintering. This base is generated above the raft at the desired distance, and is attached directly to the support.

## 4.6 Import STL as supports in the support generation module




This allows the possibility to import any STL part into the support generation module. Imported supports can be e-Stage supports, Magics supports, or any other STL. Magics will recognize this STL as support and it will allow the user to perform certain modifications on this support (read more about this in the post processing page).

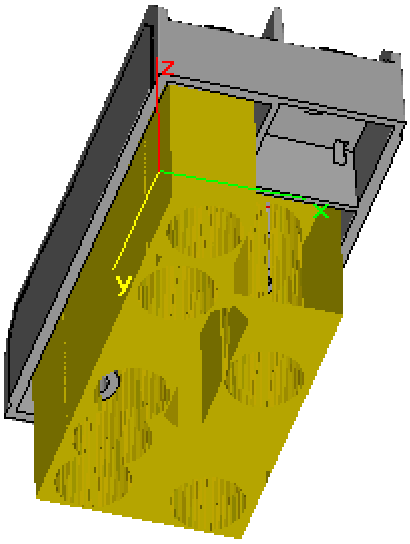
## 4.7 Saving and exporting supports

More information can be found under the ‘Support Generation’ module.

— See Saving and Exporting Supports, page 648

# 5 Chapter 5: Volume Support Generation

Prevent sand parts from breaking when you lift them out of the build envelope. Magics' volume supports guarantee extra stability to fragile sand parts and large overhangs. The software also automatically places and supports the part on a sintered platform, allowing you to lift the build construction easily.




## 5.1 Introduction

Sand parts are fragile. When they are lifted out of the build envelope, they might break. The volume support gives extra stability to the part and may support large overhangs to avoid part breakage. The part and the supports can automatically be placed on a sintered platform, called the base plate, to enable easy lifting of the built construction.

Support is only needed under certain surfaces. Magics selects these surfaces when entering the Volume Support Generation Module. The selection is made based upon the selection parameters from the Machine Setup. Once you've arrived in the volume support generator, Magics allows you to adapt the support to your needs. In the first place you can adapt the construction parameters, which are defined in the Machine Setup, interactively. This interactive change applies only to the active support. The active support is the one that is visible on your screen or, when you made them all visible, it is the one with a different color (the bad edges color; default yellow). Secondly you can remove parts of the support in 3D or remove and if necessary redraw portions of the support in the 2D-edit window. At last you can save or export the support you made. Schematically a support is generated in the following steps:

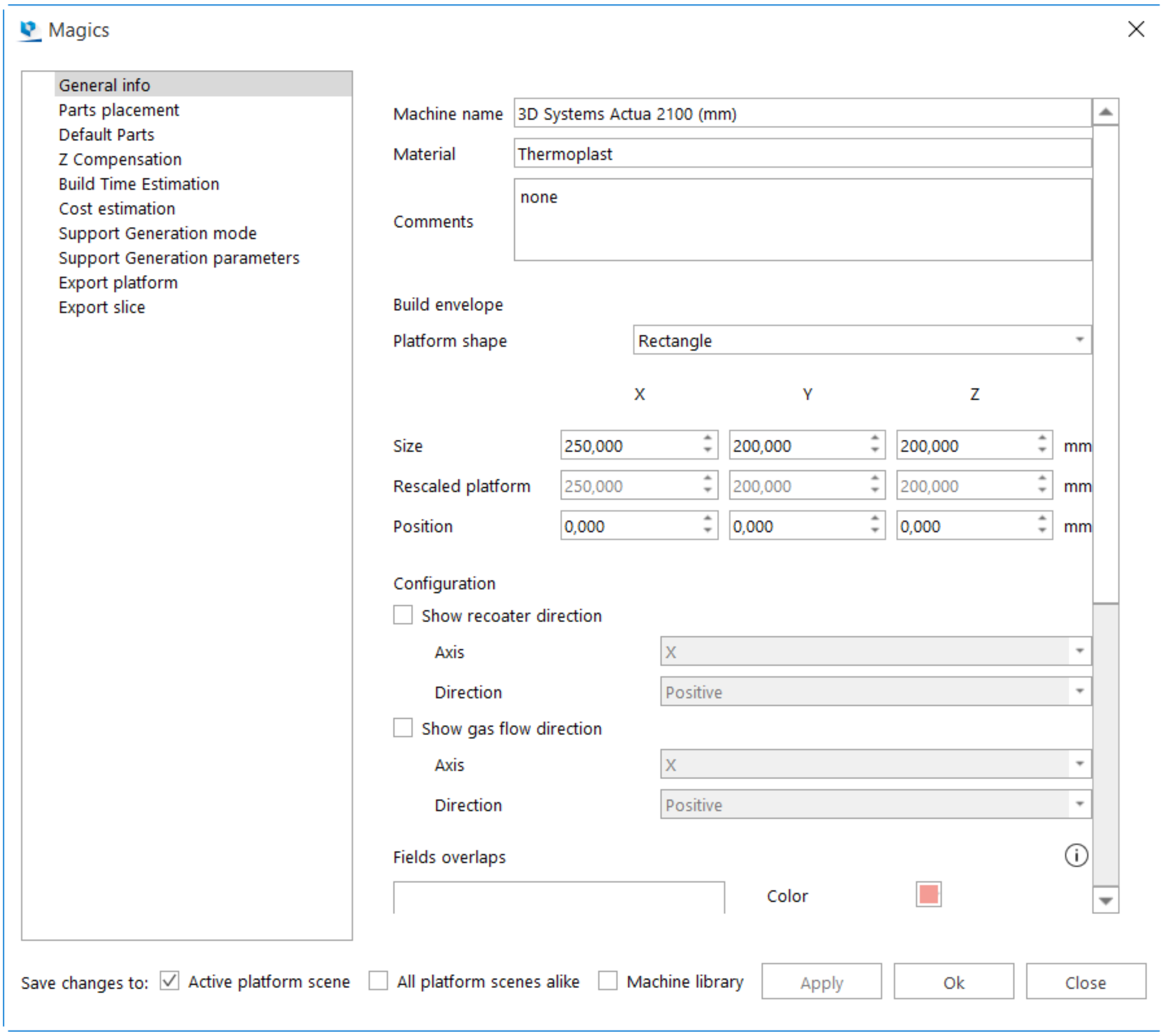
1. Definition of the selection and the construction parameters in the Machine Setup
2. Modifying the construction parameters
3. Adapting the volume supports
4. Saving and exporting the volume supports

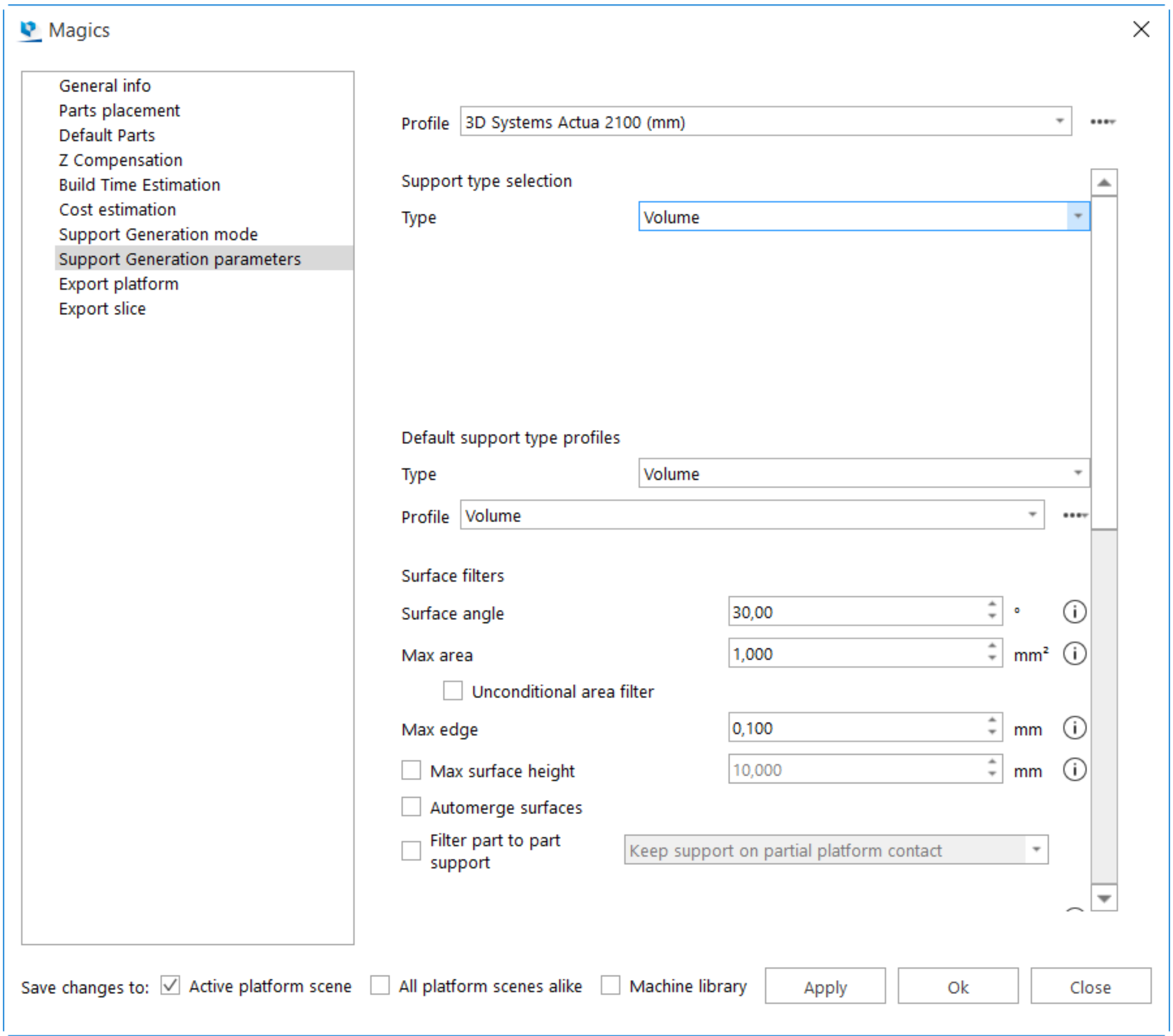
There are also special visualization options for the visualization of volume supports.

## 5.2 Automatic Volume Support Generation

Automatic support generation is done in different steps.

If you would like to generate support, you first have to go to Build Preparation/My Machines. Here you select a machine and you define the properties of this machine. The parameters for the volume support generation are defined here just like all the other program parameters and they are stored machine by machine. You can make use of the predefined machines, but you can also generate your own machines.



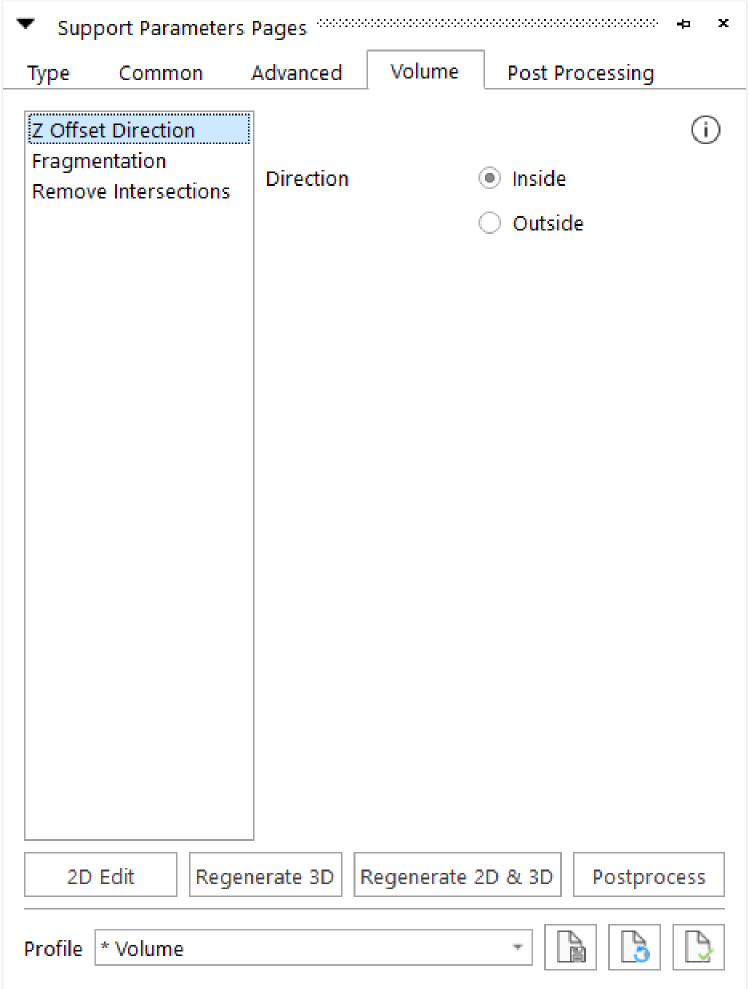


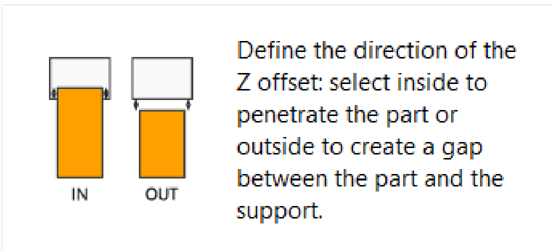

The Support type selection in the Support Generation parameters allows the user to choose the appropriate support generation method. If you choose none, no support will be generated. In this case you choose volumes.

First, the surfaces that need support are selected. This is done based on the Surface filters. These parameters determine which surfaces will get a support, however, once you are in the support mode, you can add or remove selected surfaces. Next, the Default support type profiles define the offsets of the support relative to the surface and it will define the automatically generated supports. In the support mode you can set these parameters interactively for each selected surface separately and regenerate the support.

# 5.3 Volume Support Generation Parameters

## 5.3.1 Z Offset Direction



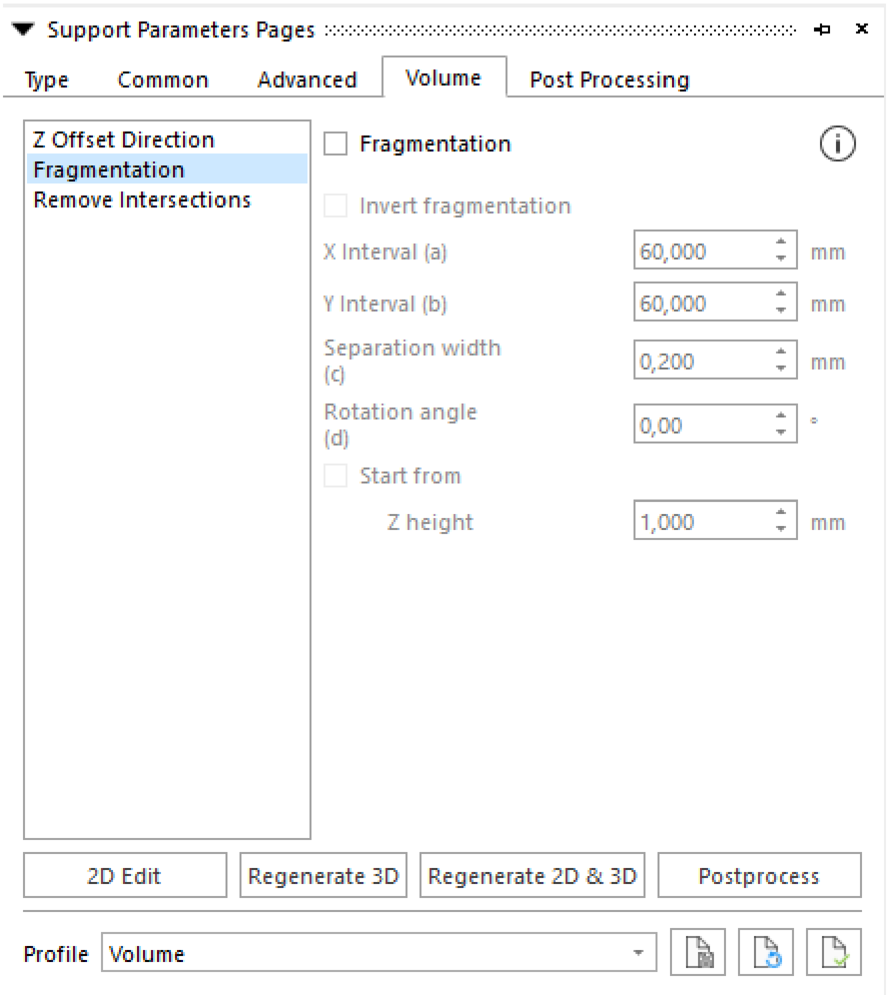

| | | |
|---|---|---|
| Direction | Defines the direction of the Z offset | |
| | Inside | Support structure created underneath the surface. So there is a gap between the surface and support |
| | Outside | Support structure created above the surface. The support goes partly inside the part. |

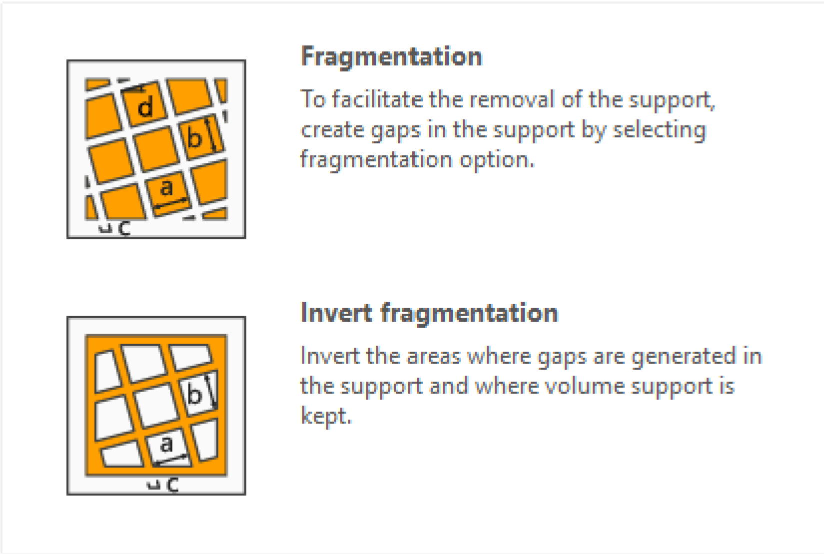
*Remark*: Parameters depending on XY offset found in the common parameters.

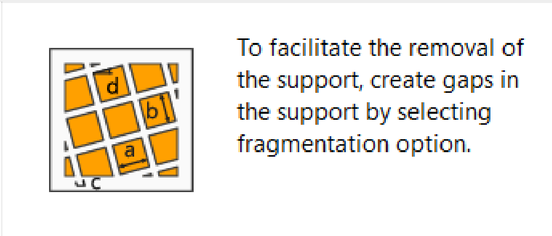
### 5.3.2 Fragmentation

When fragmenting volume support you avoid large cross sections in your support, this won't result in high thermal stress and increases build successes.

Fragmentation can also be rotated, to avoid fragmentation slots which are parallel to the recoater of the machine.

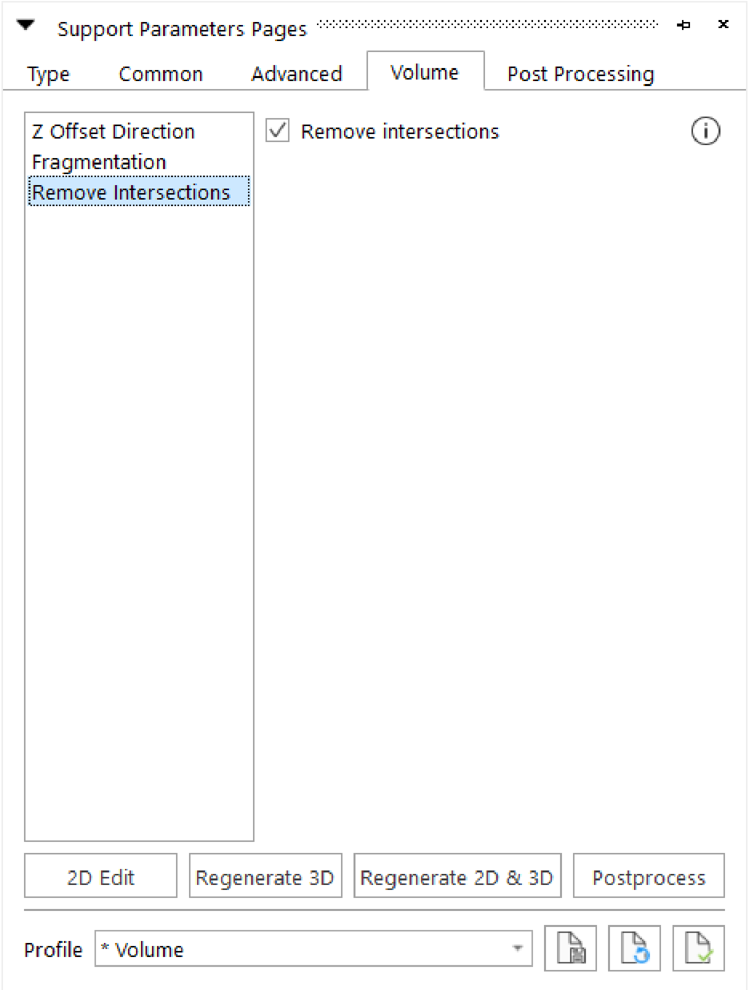


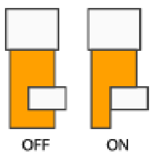



| Fragmentation | | |
|---|---|---|
| | Invert fragmentation | Invert the areas where gaps are generated |
| | X Interval | Distance between fragments along X axis |
| | Y Interval | Distance between fragments along Y axis |
| | Separation Width | Distance between 2 fragments |
| | Rotation Angle | Rotation Angle around Z axis. |

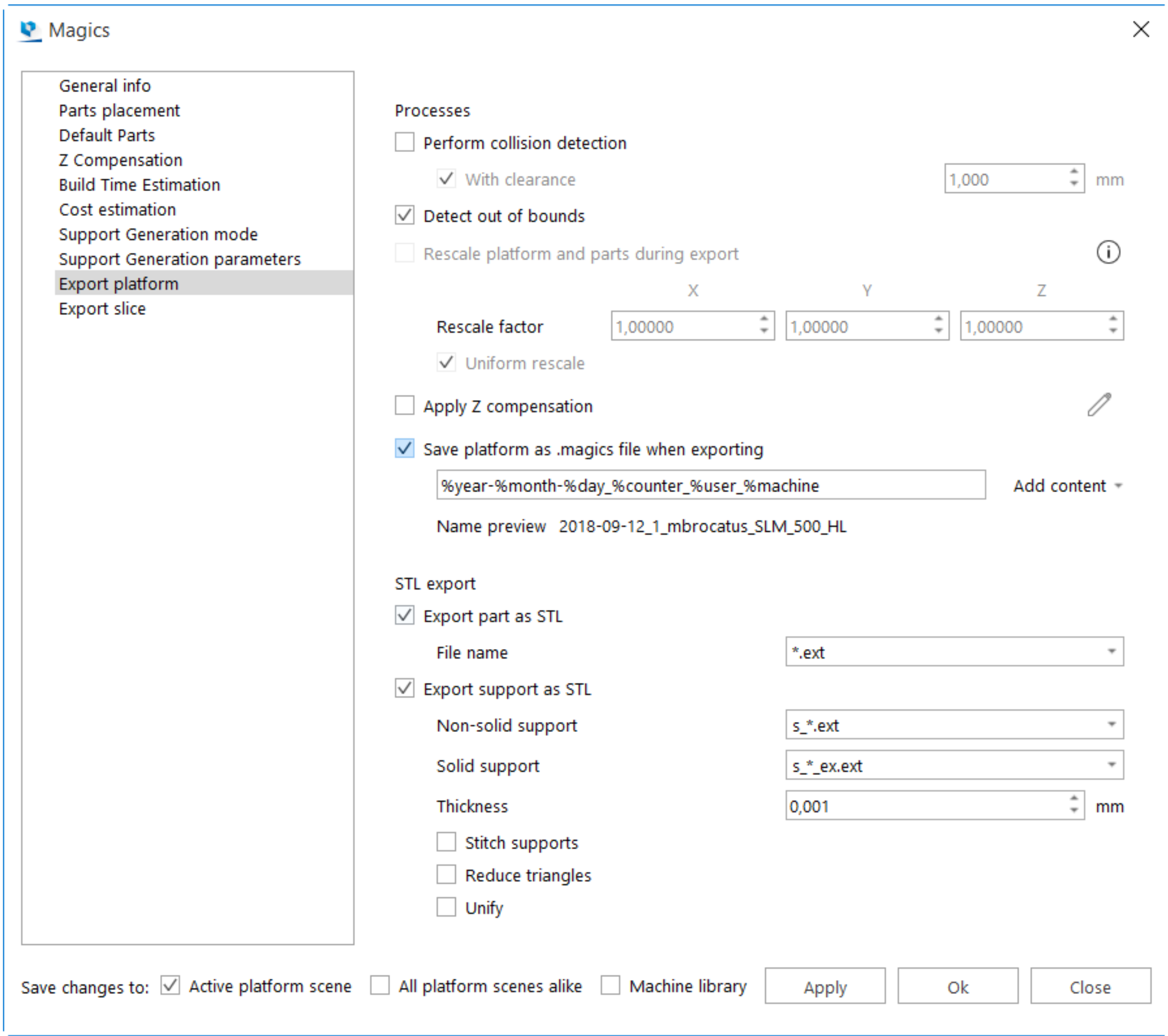
### 5.3.3 Remove intersections

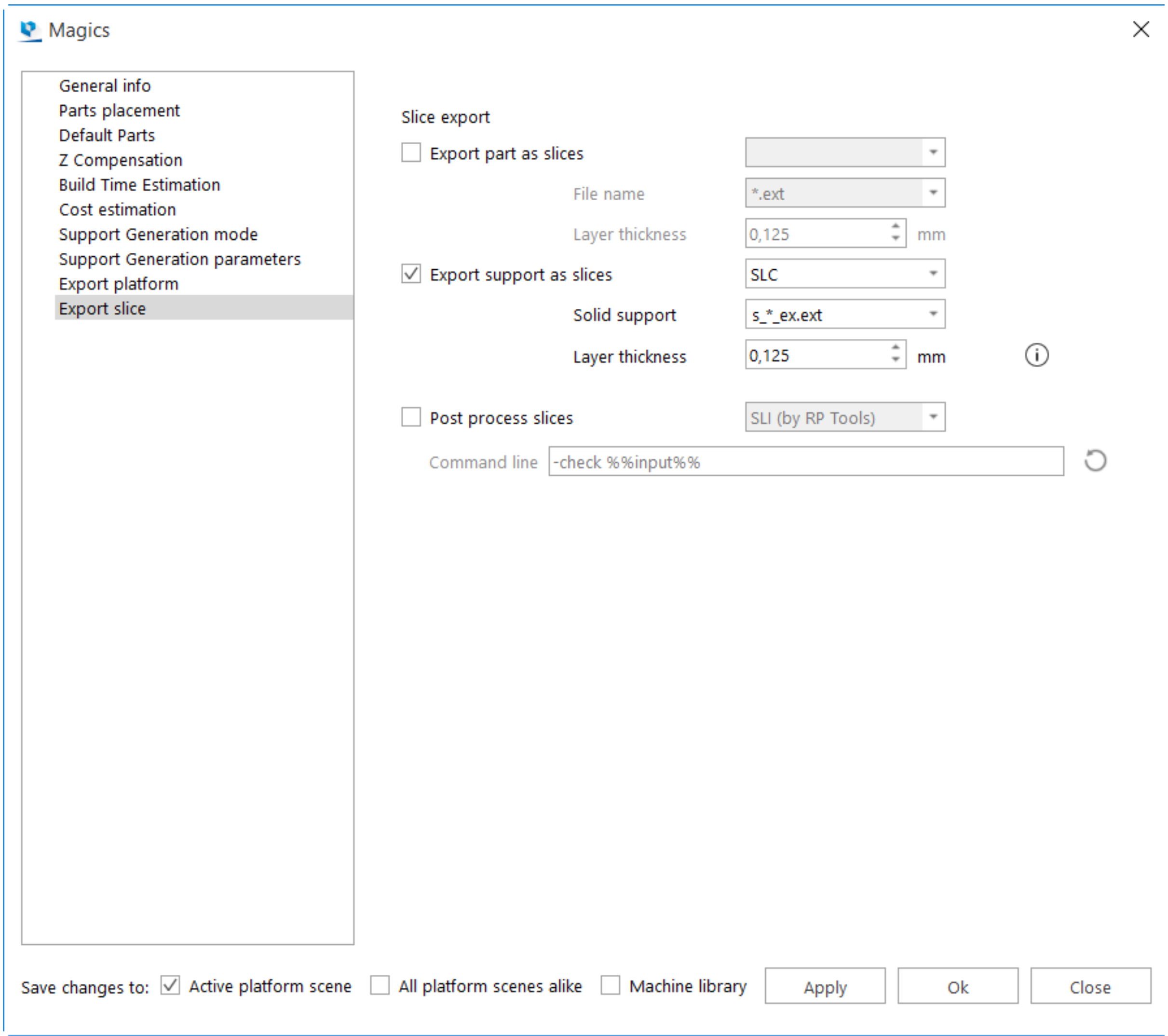



Remove unwanted intersections of volume support in case of part to part support. Support is not generated below the extra part surface where the volume support is located.

### 5.3.4 Export Properties






Magics saves the supports in its own file format, .magics. The files of this format have the extension "sup". This is not an STL – file and cannot be send to an RP machine. If, in the Base Module, you choose for Export, the support will be exported too. The name of the support will be "s_*.ext" or "*_s.ext" where the asterisk (*) will be replaced by the name of your part and the extension (ext) will be the one of your choice (SLI, SSL, CLI...) according to the type of sliced file you need. Optionally you can ask Magics to export (save) the support as an STL-file.

Each machine has its own rescale factors (to compensate for shrinkage) or Z-compensation values (to compensate for overcure). To facilitate easy swapping of parts between the machines, the rescale factor and Z-compensation value is a parameter of the machine. When exporting a platform, the selected operation (Z-comp or rescale) will be applied before saving the parts to disk. This means that you don't have to rescale or Z-compensate your parts manually. It's done automatically when exporting your platform.

When the rescaling option is selected, the platform representing the build-envelop in Magics is rescaled so that after the rescale when exporting, the building platform has its correct size.

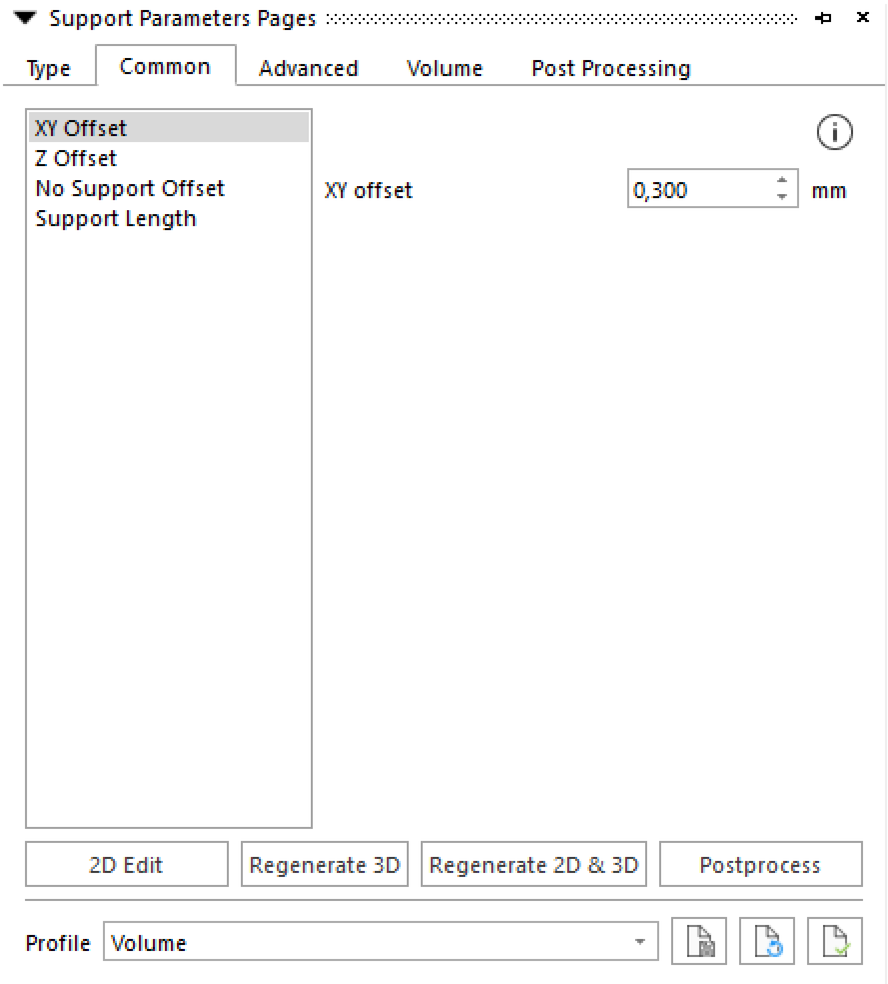
## 5.4 Modifying Surfaces, Support and Parameters

When you entered the volume support generator mode, surfaces to be supported are automatically selected following the construction parameters and the selection parameters. In the support mode you can interactively adapt the construction parameters and support parameters, select other surfaces, merge and deselect surfaces.

More information can be found under the ‘Support Generation’ module.

— See Support Types & Parameters, page 628

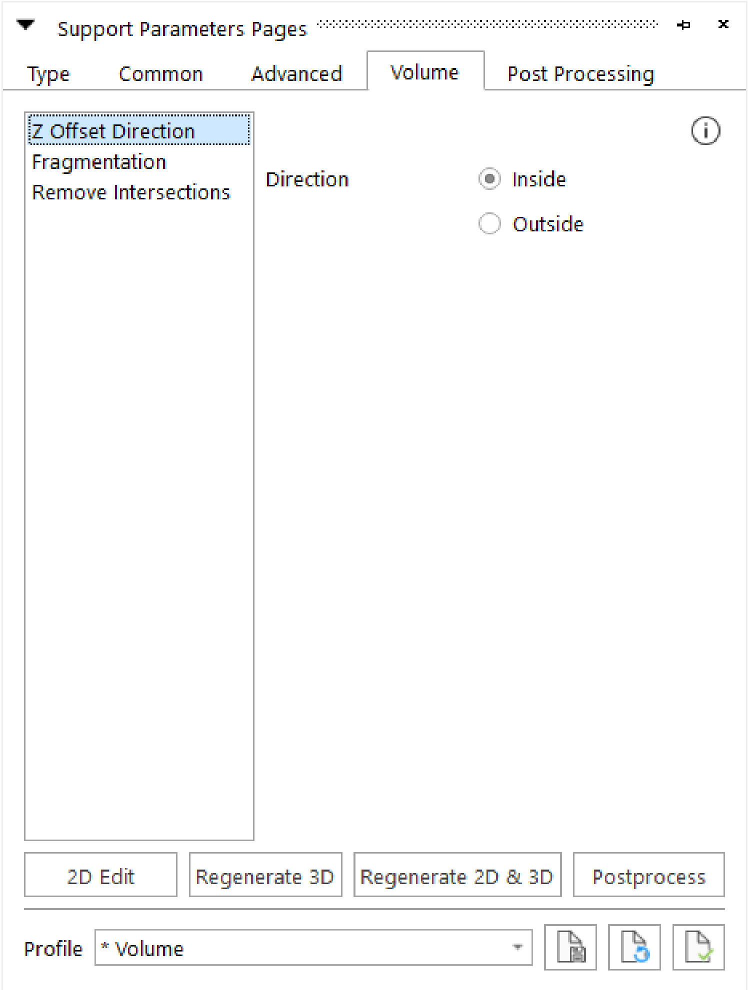
### 5.4.1 Common Toolpage




More information can be found in the ‘Support Generation’ module.

— See Common, page 527

### 5.4.2 Volume toolpage




More information can be found in Volume Support Generation Parameters; page 712

## 5.5 2D and 3D Editing of Supports

When the volume supports are calculated and you have adapted the construction parameters where needed, you can inspect them and modify the support structure itself. In 3D support can be adapted in a limited way. In 2D support can be changed in a more powerful way. You can delete supports, cut portions out of it and draw new portions of a support.

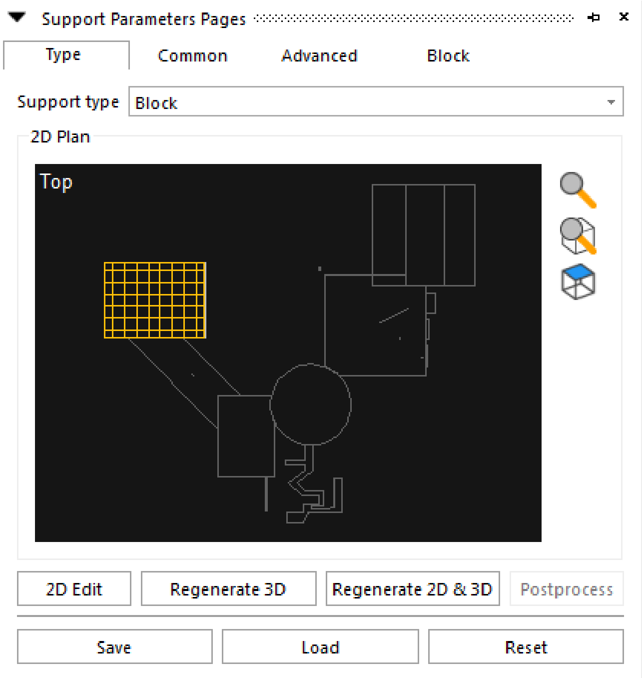
### 5.5.1 3D Editing of Volume Supports

| | |
|---|---|
|  | Select Polyline: Selects a polyline of the active support. A second click will deselect it. |

| | |
|---|---|
|  | Support: selects the whole support. |
|  | Deselect all: Deselect all selected supports. |
|  | Delete selected: Delete all selected support structures. |

## 5.5.2 2D Editing of Volume Supports

### *5.5.2.1 Type Selection*




Here you can make a selection of the support type. There are only two options to place a volume support on a surface: either you place one or you don’t. If you do the automatic support generation with the *Select All None Support* ON, Magics will select surfaces following the parameters set, but it will not place supports. You can use this buttons to place a support under the selected surfaces where you think it is necessary.

### *5.5.2.2 Surface Selection*

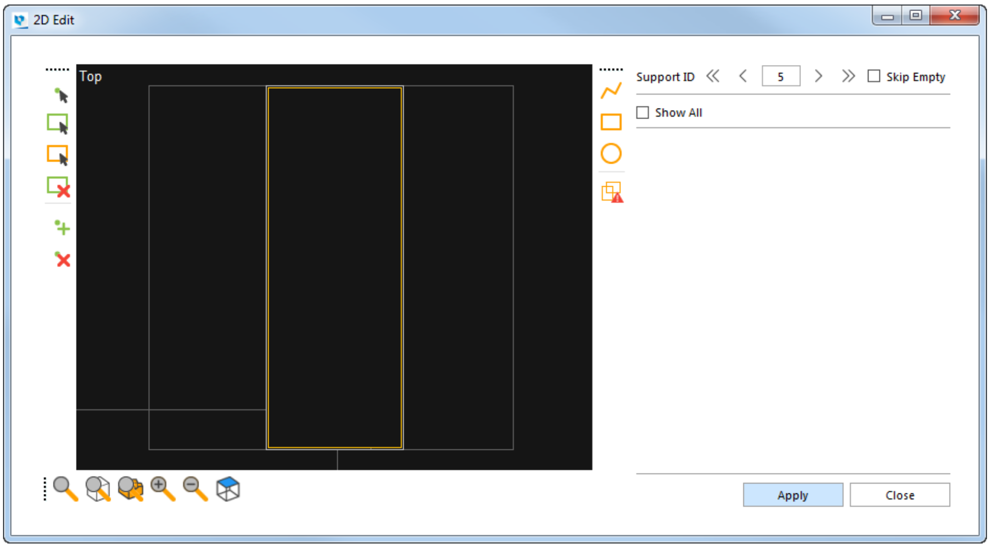
During the automatic support generation, a number of surfaces are selected based on the surface selection parameters. Default the biggest surface is catalogued as the first surface in the list. With the arrows you can inspect all the surfaces and supports.

From left to right:

| | |
|---|---|
| « | Return to surface one. |
| ‹ | Return to the previous surface. |
| 1 | Window showing surface number. |
| › | Go to the next surface. |
| » | Go to the last selected surface. |
| Skip Empty Supports | All surfaces, which are selected by the surface angle but do not need supports following the selection parameters (no support offset, surface filter…), are skipped. |

### *5.5.2.3 2D edit dialog*

To start the editing in 2D, click the 2D Edit button in the Type Toolpage. A new window appears with a 2D representation of the part (see figure below).




#### 5.5.2.3.1 Zoom toolbar

| | |
|---|---|
| | Zoom: Click and drag to zoom in on the desired window. |
| | Zoom on part: This is an automatic zoom to make the entire part visible. |

| | |
|---|---|
| | Zoom on surface: This is an automatic zoom to make the entire selected surface visible.<br>When a new surface is selected, the zoom on surface will be automatically performed. |
| | Zoom in and Zoom out: By clicking either of these buttons you zoom in/out around the center of the image with a fixed zoom factor. |
| | Flip view: Switch view of the part between top and bottom. |

The regular zoom and pan buttons allow you also to zoom and pan in the 2D edit window.

#### 5.5.2.3.2 Draw Shapes

In the 2D edit mode, you can draw 2D volume supports yourself. You draw them in 2D and when you apply them (click on the Apply button), the volume supports are trimmed in 3D on the part. There are three default shapes: polyline, rectangle and circle. When you draw a freeform surface, mind the fact that no crossing lines are allowed.

| | |
|---|---|
| | Draw a polygonal volume support. |
| | Draw a rectangular volume support. |
| | Draw a circular volume support. |

#### 5.5.2.3.3 Change Drawn Shapes

Once you have drawn a standard shape, you still can change the shape. You can add a point to the contour, you can delete a point or you can move the point.

| | |
|---|---|
| | Select anchor point: Select a point of the contour. Hold and drag to move the point. |
| | Add anchor point: Add a point to the contour by clicking on it. |
| | Remove anchor point: Delete a point of the contour by clicking on an existing one. |

#### 5.5.2.3.4 Select and Delete

You can also select and delete support structures in the 2D window.

| | |
|---|---|
| | Select Polyline: select a closed polyline of the active support. |
| | Deselect all: Deselect all selected supports. |

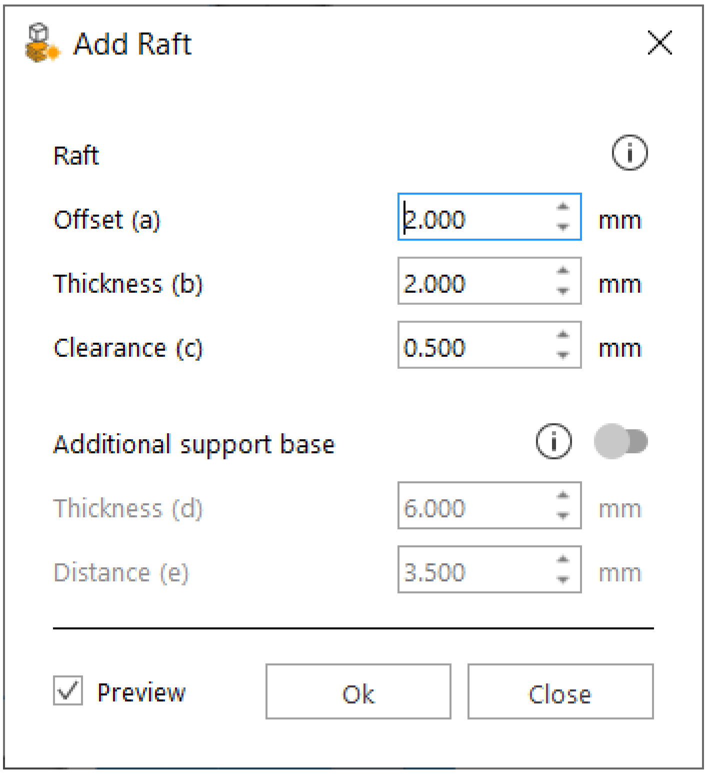
| | |
|---|---|
| | Delete selected: Delete all selected support structures. |

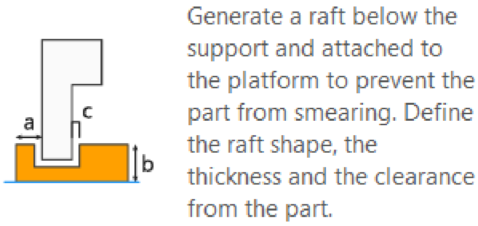
### 5.5.2.3.5 Detect Shape Intersections

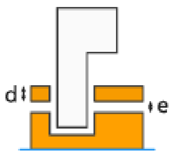
| | |
|---|---|
| | Since the generated supports are volume supports, the supports may not intersect. The intersection button does a check on this rule. If an intersecting contour is found it the modifications to the support cannot be applied. |

## 5.6 Add Raft

The user can add smear raft under the support in 3D






Add an additional support plate to establish a stable base for sintering. This base is generated above the raft at the desired distance, and is attached directly to the support.

## 5.7 Saving and Exporting Volume Supports

More information can be found under the ‘Support Generation’ module.

— See Saving and Exporting Supports, page 648

## 5.8 Visualization of Support Structures

Visualization options of the support structures are defined in the Settings, on the page Supports (Settings/Visualization/Supports).

— See Supports on page 335

Show or hide the support of all parts present on the scene by using the command Support Visibility (see more information in paragraph Support Visibility).

# 6 Chapter 6: Tree Support

## 6.1 Introduction

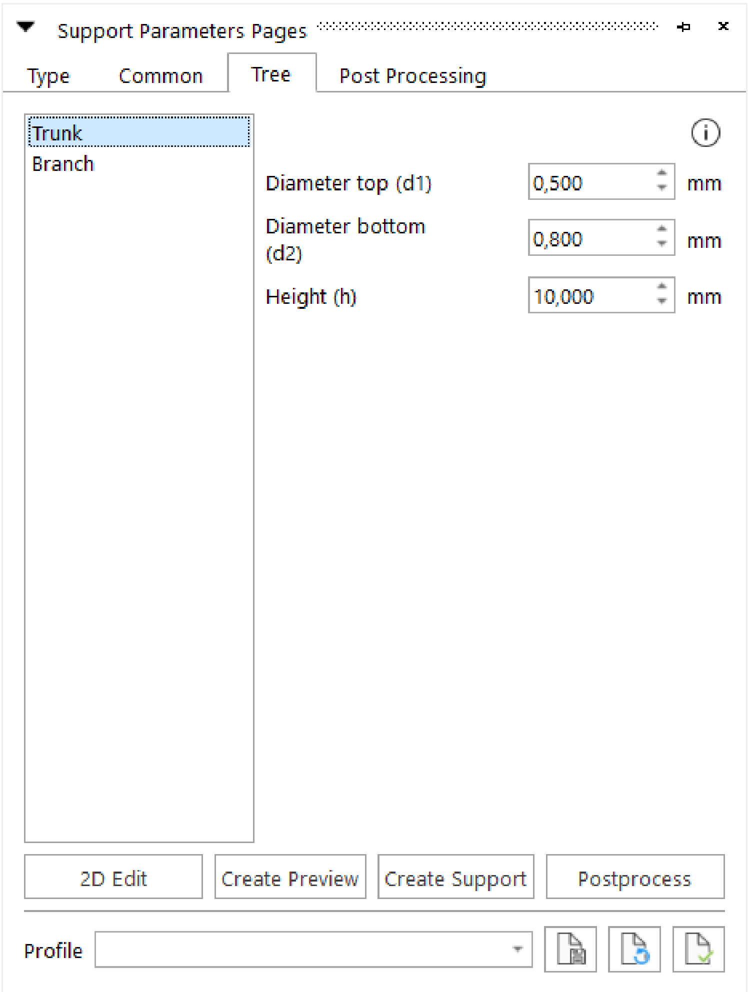
The Magics Tree Support module helps to generate a tree support. A tree support allows you to build a support with a minimal use of material, also providing you with an easy removal of the support.

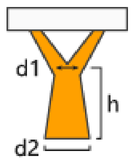
## 6.2 Tree support parameters

### 6.2.1 Support parameters

#### *6.2.1.1 Tree*

##### 6.2.1.1.1 Trunk

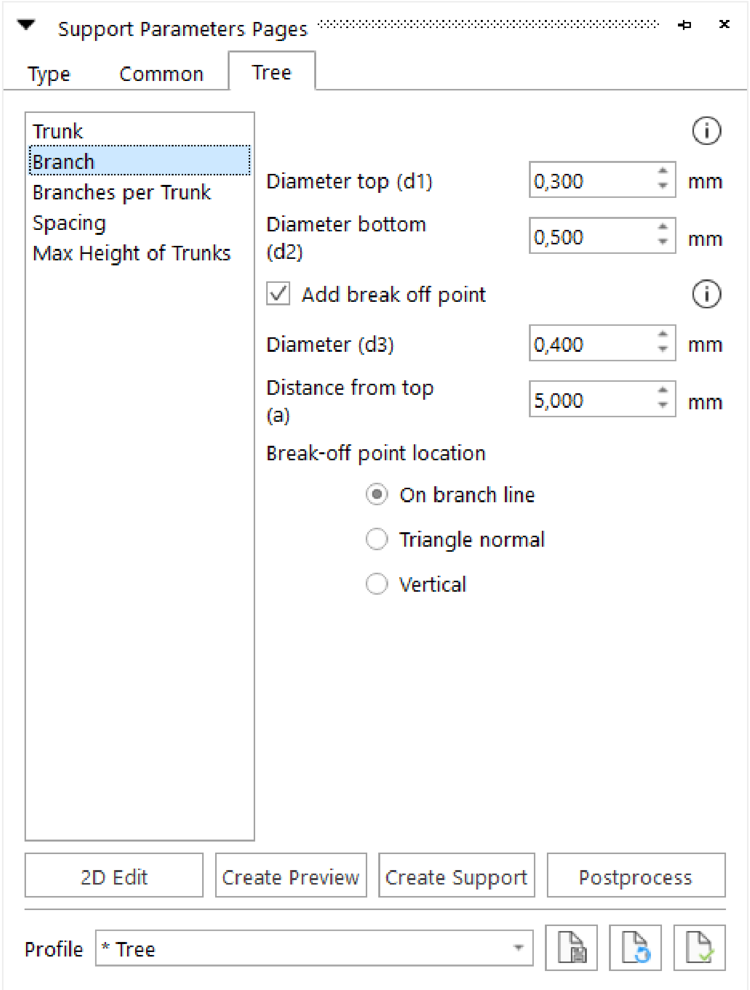


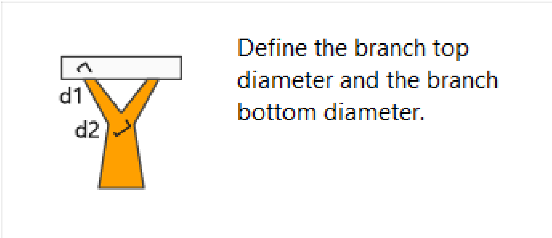



Define the trunk top diameter and the trunk bottom diameter. Height is only used in manual trees.

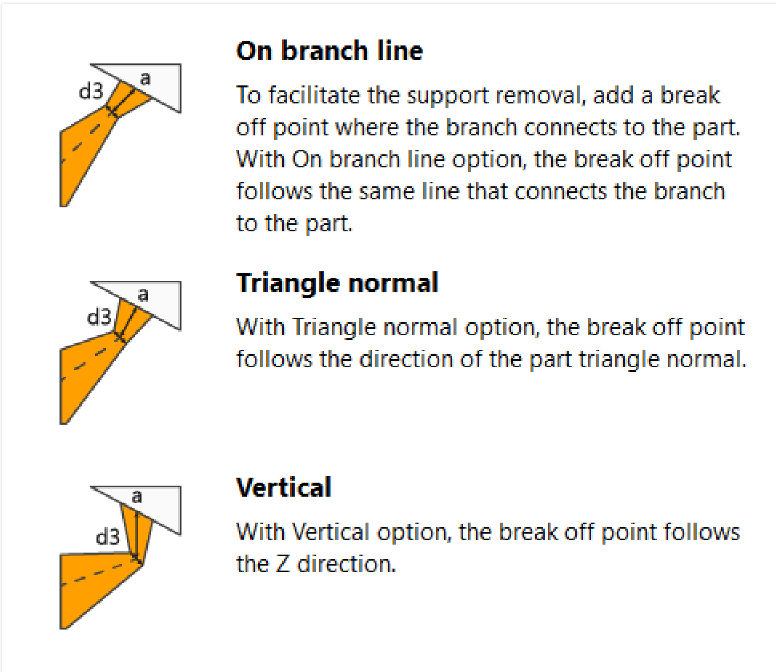
| | |
|---|---|
| Trunk | Defines tree support trunk parameters |
| Diameter top (d1) | Diameter of the trunk at the top |
| Diameter bottom (d2) | Diameter of the trunk at the bottom |
| Height (h) | Height of your trunk |

## 6.2.1.1.2 Branch

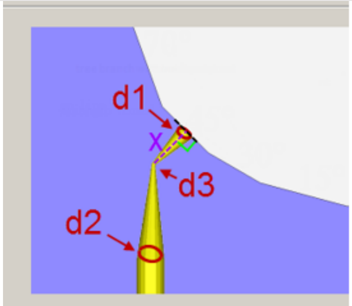
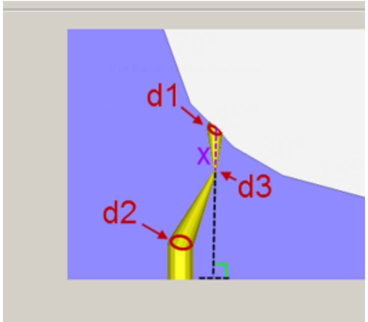




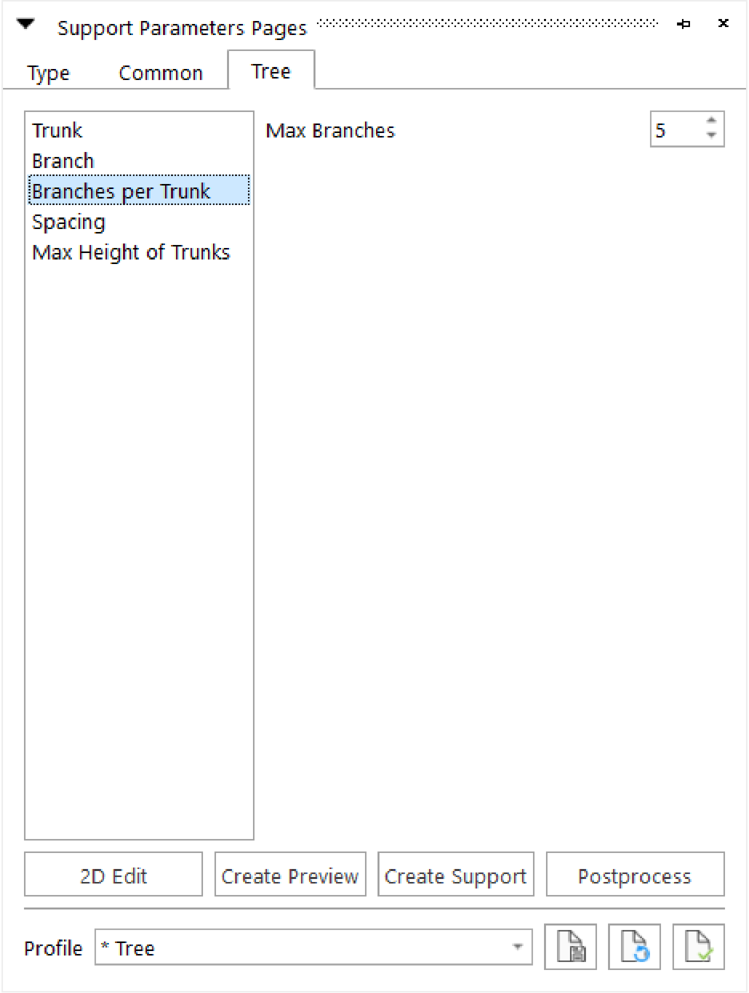

| | | |
|---|---|---|
| Branch | Defines tree support branch parameters | |
| Diameter top (d1) | Diameter of the branch at the top (where connected to the part) | |
| Diameter bottom (d2) | Diameter of the branch | |




| | | |
|---|---|---|
| Add break-off point | Add break off point at the extremity of your branch in contact with the part | |
| | Diameter (d3) | Break off point diameter |
| | Distance from top (x) | Distance between your break off point and the part |
| Break-off point location | On branch line | Break off point will be generated on the same line connecting branch to the part |
| | Triangle normal | Break off point will be generated following the triangle's normal direction |

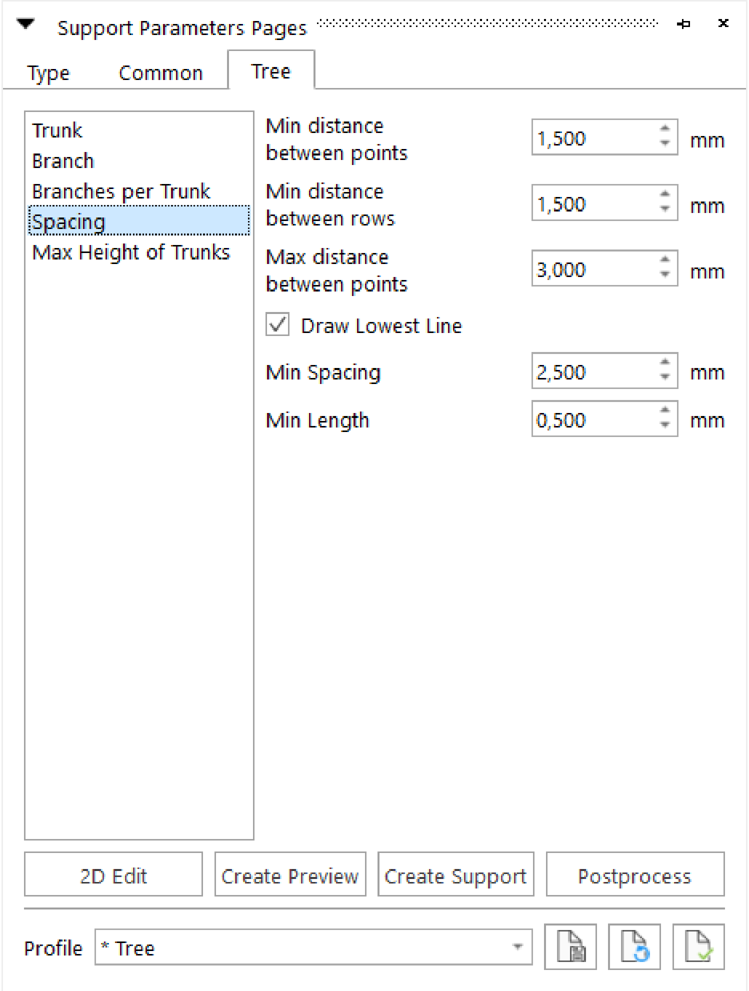
| | | |
|---|---|---|
| |  | |
| | Vertical<br> | Break off point will be generated vertically |

#### 6.2.1.1.3 Branches per Trunk




| | |
|---|---|
| Max branches per trunk | Defines the maximum amount of branches that can be created per trunk |

#### 6.2.1.1.4 Spacing

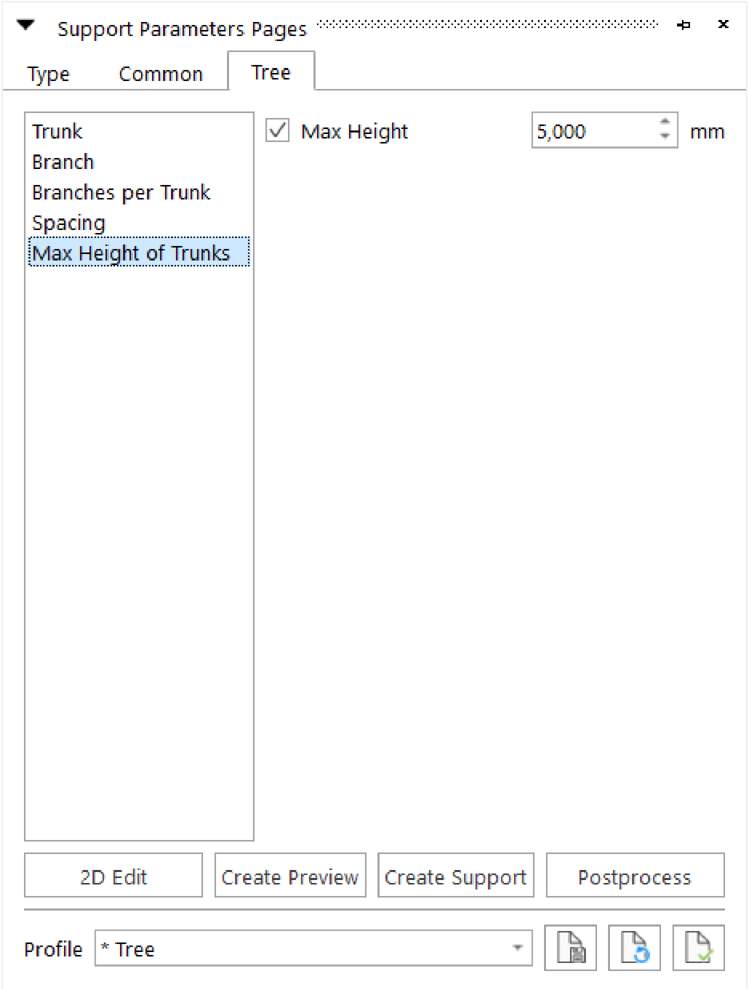



These are the same parameters as used in cone supports.

| | |
|---|---|
| Min distance between connection points | Space between connection points |
| Min distance between rows | Space between rows of connection points |
| Max distance between connection points | The maximum space between connection points |
| Draw Lowest Line | When placing a support under a curved surface, it can happen that the lowest line (= the imaginary line connecting the lowest points of the surface) is not supported correctly. This can cause problems when building the part with some RP-techniques. When lowest line is checked, an extra line of support will be placed so that this lowest line is correctly supported. |
| Minimal spacing (a) | Defines the minimal spacing between the connection points along the lowest line. |

| | |
|---|---|
| Minimum length | Lowest lines smaller then this value (length) will be filtered out |

#### 6.2.1.1.5 Max Height of Trunk




| | |
|---|---|
| Max height of trunks | If checked, the maximum height of trunks will be limited by the entered value. |

### *6.2.1.2 Other support parameters*

More information can be found within the ‘Support Generation’, ‘SG+’ and ‘Volume Support Generation’ module.

— See Chapter 3: Support Generation, page 506

## 6.3 Support toolbox

### 6.3.1 Type

More information can be found under the ‘Support Generation’ module.

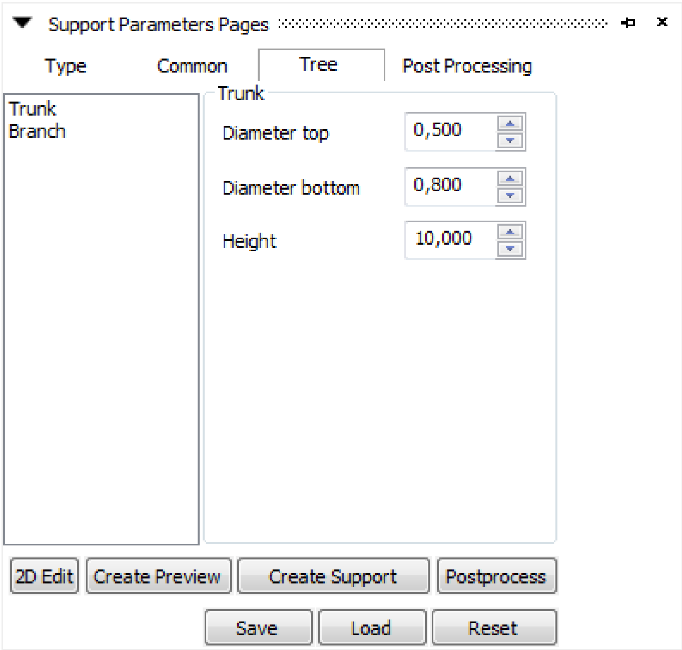
- See
- Type Toolpage page 635

### 6.3.2 Common

More information can be found under the ‘Support Generation’ module.

- See Common Toolpage, page 636

### 6.3.3 Tree




Detailed explanation on the tree parameters can be found in the advanced support parameters from the machine properties.

## 6.4 Creation of tree supports

Trees can be created in three ways: manually, semi-automatically and automatically. In each case, the tree support is first generated in a 'preview' state. Once all adjustments are made, the tree support still needs to be created.


### 6.4.1 Create tree support manually

To start a manual tree support, you have to press 'Start tree support'. This will create a new support ID in the support list. After that, you can create a trunk and connect branches from the part to the trunk. Following commands are used in the creation of manual tree supports:

| | |
|---|---|
| Start tree support | Creates a new support ID and other functions on the 'tree support' toolbar become active. |
| Create trunk | Create a trunk as base of your tree support |
| Create branches | Create branches to be connected to the trunk. |
| Edit nodes | Reposition nodes of your tree support. |
| Select tree element | Select a tree element for further editing or removal |
| Delete selected tree element | Selected elements are deleted |

### 6.4.2 Create tree supports semi-automatically

To start a semi-automatic tree support, you have to press 'Start Autotree'. This will create a new support ID in the support list. Next, the user can define connection points by clicking on the model. These connection points are the points where the support should be attached to the part. Once you have selected the desired points, you should press 'create preview'. This will automatically generate a tree preview based on the points and the parameters that are defined in the 'Support Parameter Pages'. The preview can still be edited with the 'Tree Support Tools'. Following commands are used in the creation of the semi-automatic tree supports:

| | |
|---|---|
| Start Autotree | Creates a new support ID and semi-automatic tree functions will be become active. |

| | |
|---|---|
| Connection points | You can click on the part to define connection points. You can move a point by clicking and dragging it. . By holding CTRL and click, you can select multiple points in order to delete them. |
| Delete Connection points | Deletes the selected points. |
| Create branches | Create branches to be connected to the trunk. |
| Edit nodes | Reposition nodes of your tree support. |
| Select tree element | Select a tree element for further editing or removal |
| Delete selected tree element | Selected elements are deleted |

### 6.4.3 Create tree supports automatically

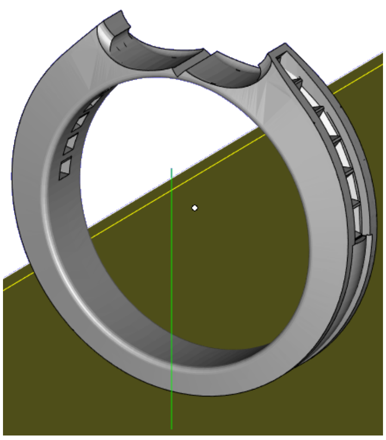
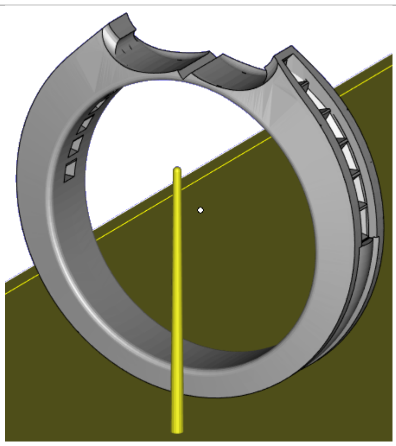
Tree supports can also be generated automatically. This means they are generated based on a surface.

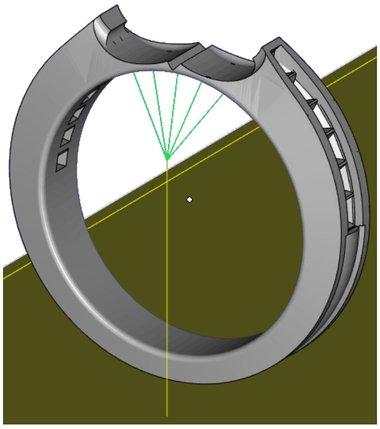
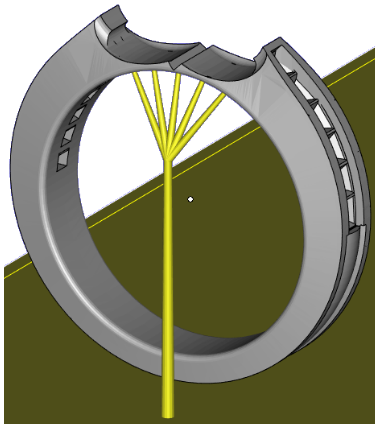
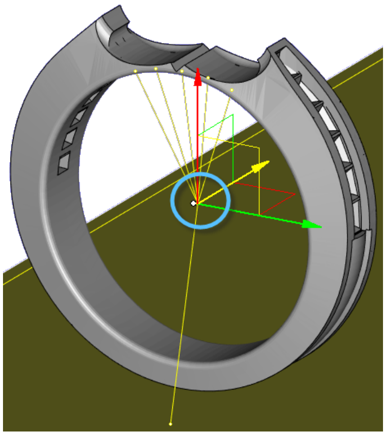
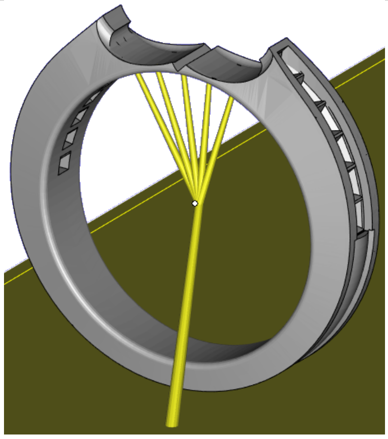
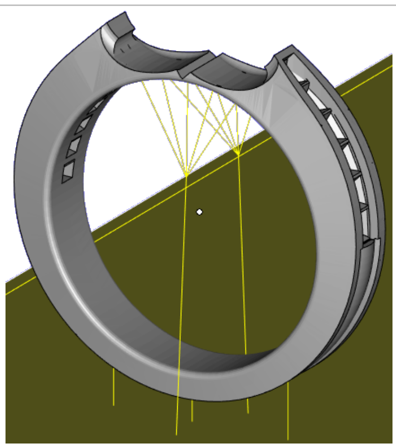
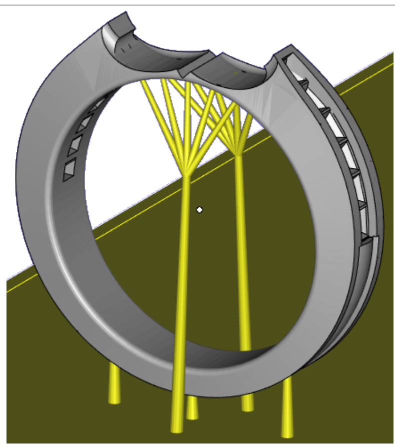
More information about surfaces can be found within the 'SG+' module.

— See Modifying Surfaces, page 628

### 6.4.4 Tree preview

While creating trees manually, a preview of the tree will be displayed. The preview makes it easier to define the correct placement of the parts of the tree and shows how the support will look. The principle of WYSIWYG (What you see is what you get) is applied here. Depending on the element added you must reload your preview via the button "Create preview" from the support toolbox. If you want to apply the preview, you should press 'create support'.

| Trunk creation | |
|---|---|
| Preview of trunk | Created trunk |
|  |  |

| Branches created | |
|---|---|
| Preview of branches | Created branches |
|  |  |
| Movement of node | |
| Preview of node movement | Creation of moved node |
|  |  |
| Example: Tree support on simple ring | |
|  |  |

## 6.5 Import STL as support in the SG module (SG+)

More information can be found under the 'SG+' module.

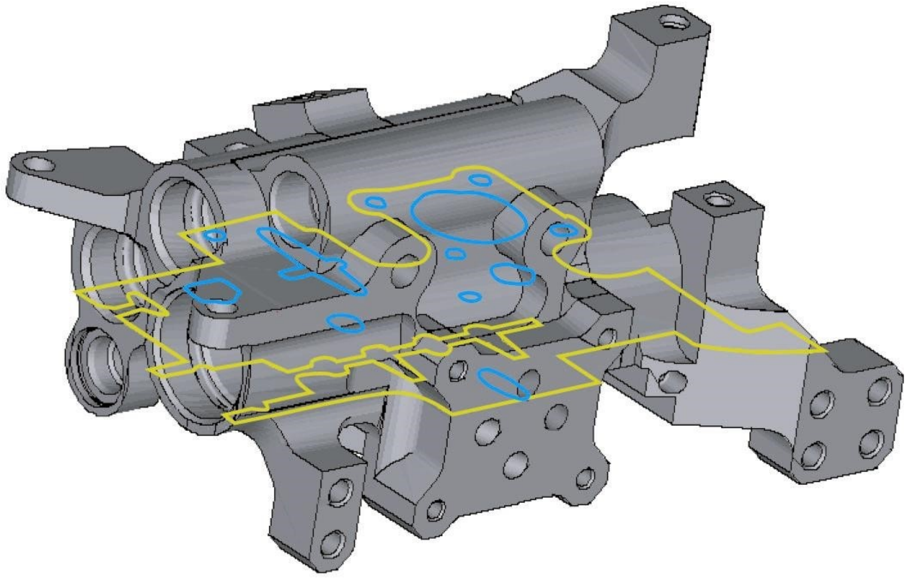
## 6.6 Saving and exporting

More information can be found under the 'Support Generation' module.

— See Saving and Exporting Supports, page 648

# 7 Chapter 7: Slicing

Prepare sliced files for production on your RP machine. The Slice module generates files that can be sent directly to most RP machines. The preview function allows you to inspect the slices before the slice command is executed. In addition, the module can repair slices automatically.



## 7.1 Introduction

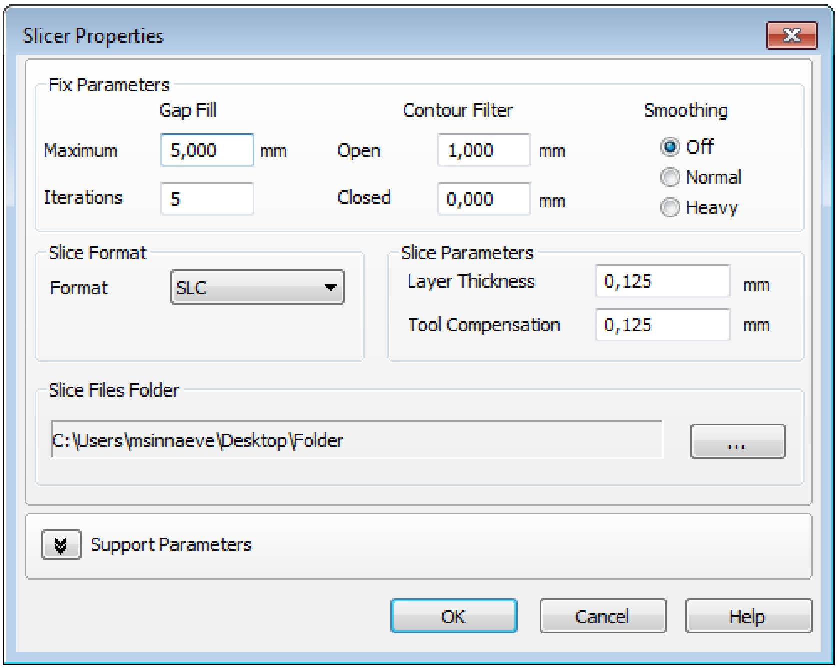
Magics allows you to output sliced files starting from STL-information. When you slice an STL-file, you make XY-cuts at different Z-positions that are related to the layer thickness used by the RP machine. If there are open contours, Magics' contour fixer automatically closes or fixes them. With the on-line slice preview, you can check the result before the slicing took place. The color of the contours indicates if you are working with a closed or an open contour.

## 7.2 The Slice ribbon

| | |
|---|---|
| Slice Preview | The slice preview shows the contours of each slice |
| Slice All | Opens up the Slicer Properties Dialog Box, where you can set the parameters for the slices. |
| Slice Selected | Opens up the Slicer Properties Dialog Box, where you can set the parameters for the slices for the selected files. |

### 7.2.1 Slicer Properties

Slice all, Slice selected and the parameter option in the preview slicer dialog box all bring you to the Slicer Properties dialog box, where you can set the parameters for the slices. The parameters set in the dialog are those of the currently selected machine, these parameters can be defined in the Machine Setup. (Menubar\ File\ Machine Set-up). The slicer properties dialog has two parts: the fix parameters and slice format part.




#### *7.2.1.1 Fix Parameters*

| | | |
|---|---|---|
| Gap Fill | Open loops (contours with gaps in it) or gaps in the contours are closed. | |
| | Maximum | This value displays the maximum gap that can be closed in a contour. |

| | | |
|---|---|---|
| | Iterations | The contour fixer can work with iterations. Working with iterations results in more accurate fixing. |
| Contour Filter | The contour filter removes small or short contours automatically. | |
| | Open | All open contours shorter than this value are removed. |
| | Closed | All closed contours shorter than this value are removed |
| Smoothing | Overlapping vector points are united and the number of vectors is reduced. This reduces the size of the slice file but details may get lost. You can choose between Off, Normal and Heavy smoothing. | |

#### *7.2.1.2 Slice Format*

| | |
|---|---|
| Format | The slicer supports the formats CLI (Common Layer Interface from EOS), SLC (3D systems Layer Contour, SPI) and SSL (Stratasys), F&S. |
| Units | If you work with the EOS CLI- format, a resolution is also asked. The default value is 0.05 mm. |

#### *7.2.1.3 Slice Parameters*

| | |
|---|---|
| Layer Thickness | Displays the layer thickness, as it will be used on the machine. |
| Tool Compensation | Displays the tool compensation (machine dependent). This is standard the radius of the used laser beam or the radius of particles of the used build material. |

#### *7.2.1.4 Slice Files Folder*

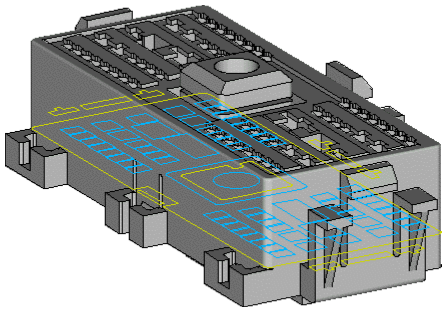
| | |
|---|---|
| Slice Files Folder | Defines the output folder for the slice files. |

### 7.2.2 Slice Preview

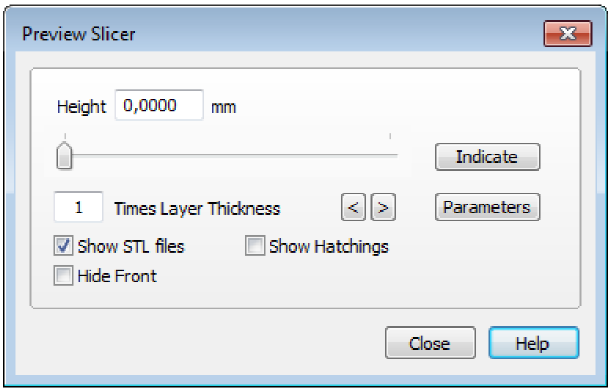
The slice preview shows the contours of each slice. The contours are color encoded:

1. Yellow: external contours
2. Blue: internal contours
3. Red: open contours

The slice preview also closes the gaps in open contours (contour fixer). The combination of the preview slice and the STL-fixer, gives you a powerful tool for effective fixing. While you are fixing, you can use the slice preview to see if the contour fixer closes the open loops due to gaps between triangles. The slices are taken in the middle of a layer.



The Preview Slicer can be accessed via the toolbar:




| | |
|---|---|
| Height | This value displays the Z-position of the slice. You can change the position of the slice by typing in the desired value. Next press the enter-button. The slice height position should be a multiple of the Layer thickness. If you enter another number, this number will be rounded to the nearest layer position. |
| Slider | You can change the position of the slice using the slide bar. |
| Indicate | This button activates the Indicate Slice Pointer. You can indicate a point on the part and a slice preview will be displayed. |
| Slice Increment (Times Layer Thickness) | This value displays how many layers the increment is, which is used while you inspect slices with the slice preview. |
| Slice Walker < > | You can walk through the part and each slice preview will be made on top of each physical slice. |
| Parameters | The slicer properties dialog is displayed. |
| Show STL files | If this option is on, the slice is real-time displayed on the shaded image. |



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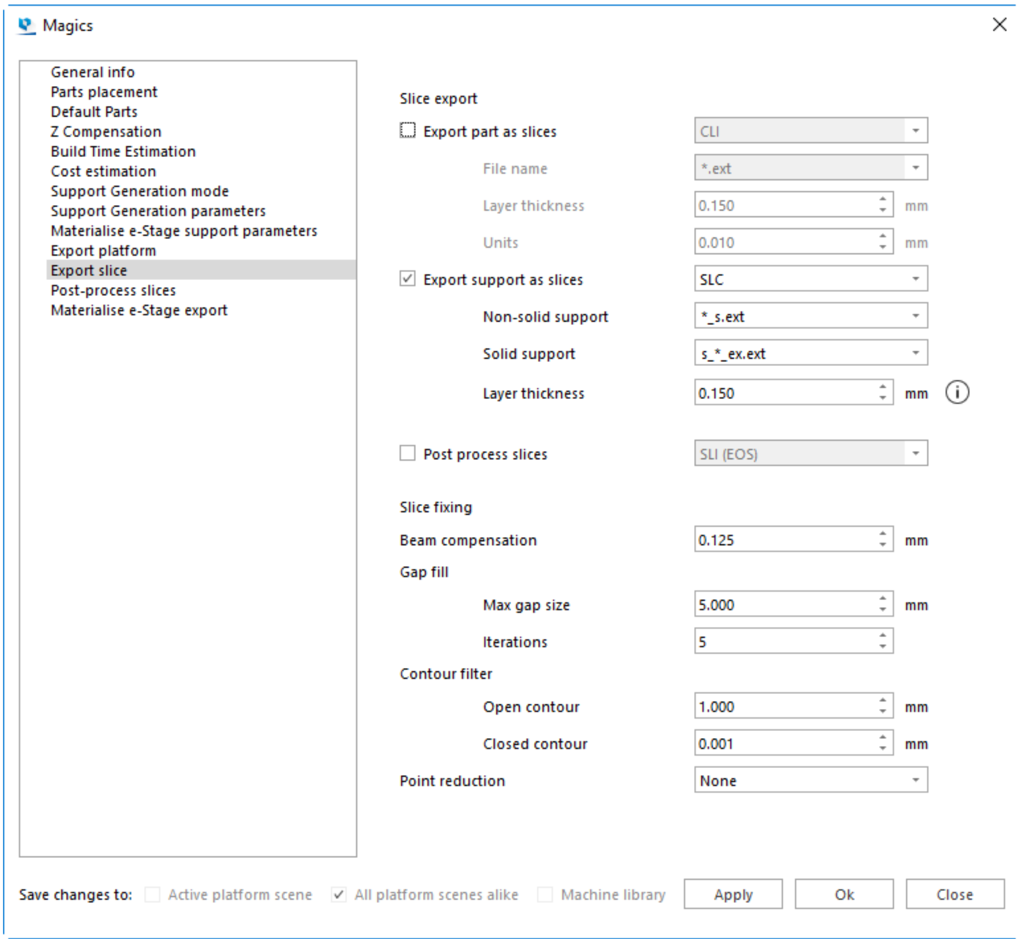
| | |
|---|---|
| Show Hatchings | A preview of the hatching is displayed on the screen. This allows you to predict if the machine will draw the hatching correctly on the part and if the hatching will be correctly trimmed. |
| Hide Front | When this option is selected, only the part that is located behind the slice (as you see it on the screen) will be visible. |

## 7.2.3 Machine Setup

### *7.2.3.1 Export slice page*

The user is able to export the part and support as slices.




— Slice export

| | | |
|---|---|---|
| Export part as slices | Layer thickness | Displays the layer thickness, as it will be used on the machine. |
| | Format | The format of the part slices |

| | | |
|---|---|---|
| | File name | The naming template of the file containing the slices. The character "*" will be replaced by the part name, while "ext" will be replaced by the slicing format chosen. |
| Export support as slices | Layer thickness | Displays the layer thickness, as it will be used on the machine. |
| | Format | The format of the support slices |
| | Units | If you work with the EOS CLI- format, a resolution is also asked. The default value is 0.05 mm. |
| | File name | The naming template of the file containing the slices. The character "*" will be replaced by the part name, while "ext" will be replaced by the slicing format chosen. |
| Post process slices | Slices can be post processed. The format must be inserted. | |

— Slice fixing

| | | |
|---|---|---|
| Beam compensation | The beam compensation takes into account the thickness of the laser beam to ensure the correct dimensions of the parts. | |
| Gap fill | Max gap size | Open loops (contours with gaps in it) or gaps in the contours will be closed.<br>The maximum gap that must be fixed by stitching. |
| | Iterations | The number of iterations used when performing a stitch. |
| Contour filter | Open contour | All open contours are filtered out when the contour length is less than the entered value. |
| | Closed contour | All closed contours are filtered out when the contour length is less than the entered value. |
| Point reduction | Point reduction is used to reduce the amount of vectors. Successive vectors that lay on one line are merged.<br>This reduces the size of the slice file but details may get lost. | |

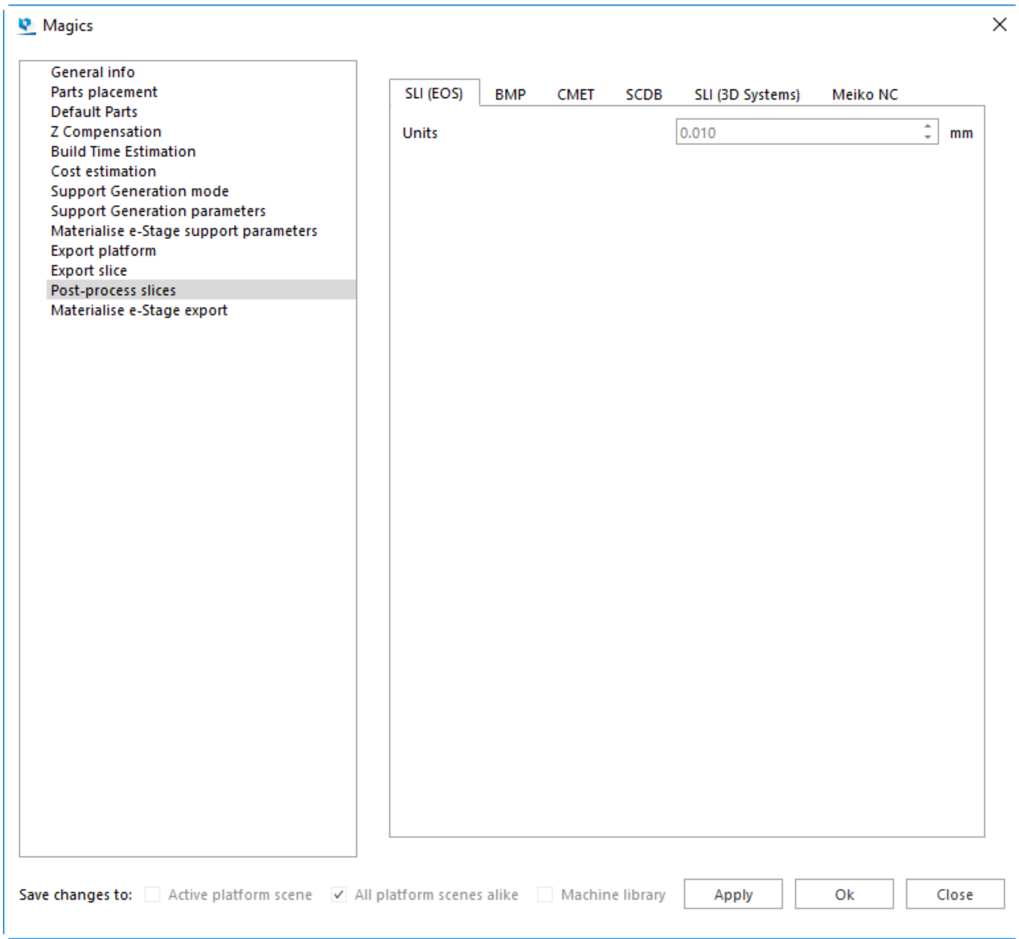
#### *7.2.3.2 Post-process slices page*

Post processing is an extra conversion to transform the slice format to a machine dependent slice format. It is then a two-step process: first the file is sliced to the format determined in the Slice properties dialog (see the section "Slicing"), and then this format is converted to the format you determine here.

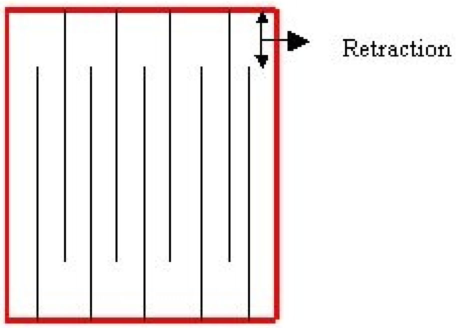
Magics can post process to:

- SLI (3D systems) (License for C-Tools needed)
- SLI (EOS)
- SCDB (License for C-Tools needed)

Different parameters are present depending on the specific format requirements.




| | |
|---|---|
| Resolution | **Unit size**<br>A position in the slice format is determined by 2 numbers<br>☐ The *unit size*<br>☐ A *unit value*<br>The final position is determined by multiplying those 2 values. For example: when the *unit size* is 0.01 mm and the *unit value* is 1254, the position is (0.01 x 1254)= 12.54mm<br>It is clear that to keep a maximum of details, the *unit size* should be as small as possible. The only restriction is that the maximum value for the *unit value* is 65536 ($2^{16}$). So the maximum distance you can cover with a *unit size* of 0.01 mm is 655.36 mm. (=0.01 x 65536). If you have a bigger machine, the solution is to make the *unit size* bigger. (For example the EOS 700 has a platform with a length of 700mm, so a bigger *unit size* must be used to cover the whole platform).<br>Thus, the first restriction for the *unit size* is: Unit size > max distance machine / 65536<br>In the slice format, the layer thickness is also expressed in the *unit size*. This results in the restriction that Layer thickness/unit size is an integer.<br><br>So we should minimize the *unit size* keeping this in mind:<br>Unit size > max distance machine / 65536<br>Unit size = layer thickness * N (where N is an integer) |

| | | |
|---|---|---|
| | When a user works in inch, the unit size stays in mm, so the factor 25.4 is introduced.<br><br>**Resolution**<br>An SL machine internally works with a resolution (the amount of defined positions per millimeter). Some machines use a unit size.<br>Both values are linked: *Resolution [1/mm] =1 / Unit size [mm]*<br>A value is used to express the position of a point. The position is retrieved with the following formula:<br>Position [mm] = value / resolution [1/mm] = value x unit size [mm]<br>The value that is used is mostly expressed with 2 bytes, so it has a maximum value (=$2^{16}$=65536). This result in the fact that the higher the resolution, the smaller the covered area because the maximum value is reached faster. | |
| Hatching | The hatchings are the hatches the laser makes to cure the volume inside the part. There are different parameters: | |
| | X Hatch | The distance between 2 hatches in the X-direction. |
| | Y Hatch | The distance between 2 hatches in the Y-direction. |
| | Alternate Layers | When switched off, each layer is hatched in both directions (X and Y). When switched on, a layer is only hatched in one direction (e.g. X-direction), the next layer will be hatched in the other direction (e.g. Y-direction). |
| | Hatch Offset | This is the distance between the border and the hatches. This parameter is to compensate the thickness of the laser beam. |
| | Hatch Filter | Hatches shorter than this length will be ignored. |
| | Save first | By determining what is saved first, you can determine if the laser first scans the borders or the hatching. |
| Hatch style | A cured resin will shrink and this shrinkage will cause internal stress, this internal stress can cause deformations. Using special techniques of hatching, the internal stress can be minimized. This will minimize the deformations. | |
| | Alternated | Instead of always hatching the part from e.g. left to right, *alternated* will hatch one layer from left to right en the next layer from right to left. |
| | Retracted | The hatches are connecting the 2 borders of the part with each other. Because the cured resin of the hatches will shrink, they will pull at the borders and a deformation will occur.<br><br>To prevent that the hatches are connecting the 2 borders, you can use the retracted-option. The hatches will only be connected to one border and leave a space at the other border so the hatch is not connecting the 2 borders anymore and so the deformation will be minimized. |

| | | |
|---|---|---|
| | Staggered | When staggered is checked, the hatches will move each layer. In this way, the hatch comes between the 2 hatches of the layer below. You can compare it with building a wall with bricks, they are not placed perfectly on top of each other but they are moved a half brick each layer. |
| Skinfills | To improve the quality of the bottom and upper layer, you can apply extra hatching, called skinfills. | |
| | Angle | When the angle of the surface is lower than the parameter 'angle', skin fills will be applied. |
| | Number | The amount of layers below/above the upfacing/downfacing layers that should contain skinfills. |
| | Hatch | The distance between the hatches of the skinfill. |
| Merge | When slicing a platform with multiple parts, each part is sliced separately. Merging these slice files, they will become 1 big SLI-file. | |
| | Merge all parts | All the SLI-files of the parts will be sliced in one SLI-file |
| | Merge all Supports | All the SLI-files of the supports will be sliced in one SLI-file |
| | First | To decide if Magics should first merge or hatch. When you choose to hatch before merging, the result is that the laser will hatch the parts one by one. When you first merge before hatching, the hatches will be calculated for all parts together, so it can be that multiple parts are hatched at the same time. |
| | Original files | To decide whether Magics should keep the original files it used for merging or not. |

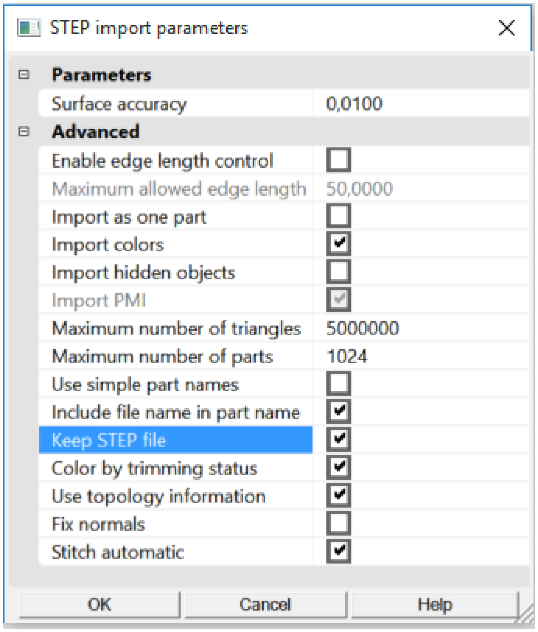
# 8 Chapter 8: STEP

## 8.1 Introduction

This functionality allows you to work with an STL file for AM while keeping corresponding STEP file for future processing for CNC.

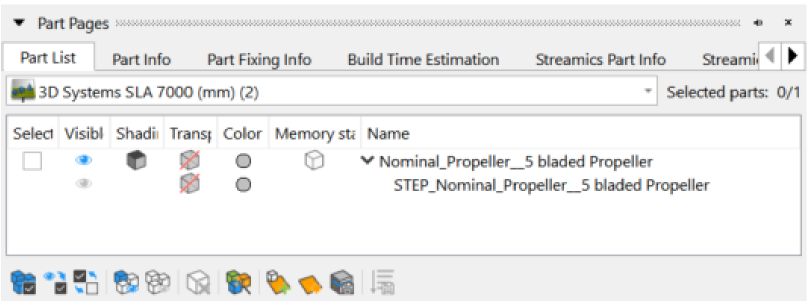
## 8.2 Import STEP file

Import STEP file is provided by MatConvert. During import, parameter “Keep STEP file” should be checked:

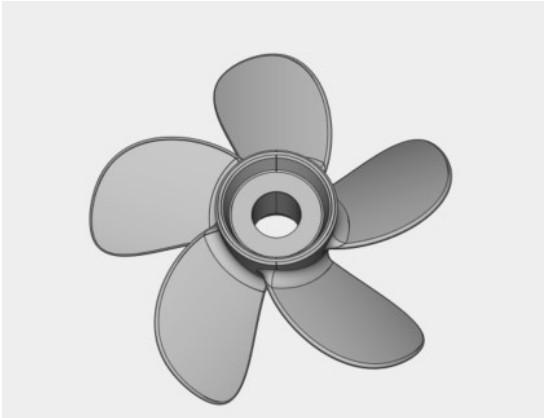



## 8.3 STEP visualization

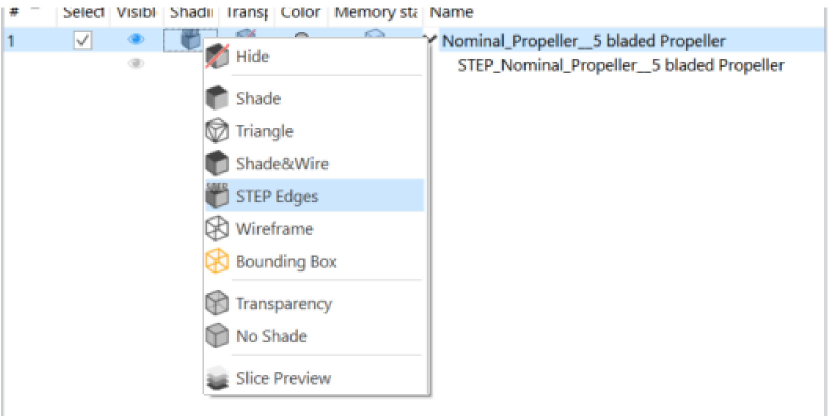
— Once STEP file was imported, together with STL part in Part list, you can also see STEP part:



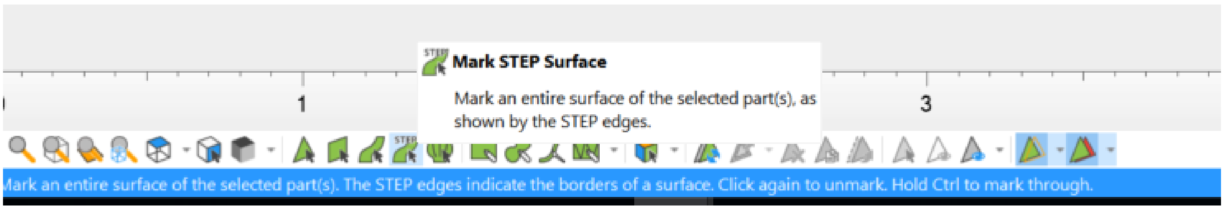
By clicking on “Visible” icon for STEP part, STEP geometry is rendered on the scene:

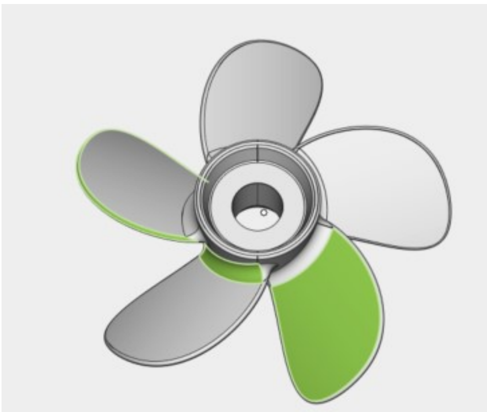


— Choosing STEP Edges Shading mode for STL part, you can see appropriate STEP surfaces on STL.



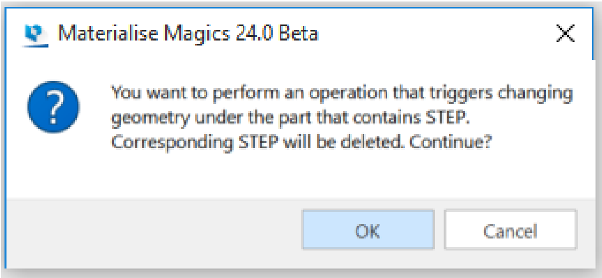

— Using new marking mode Mark STEP surface you can easily mark surface on your STL for future processing:



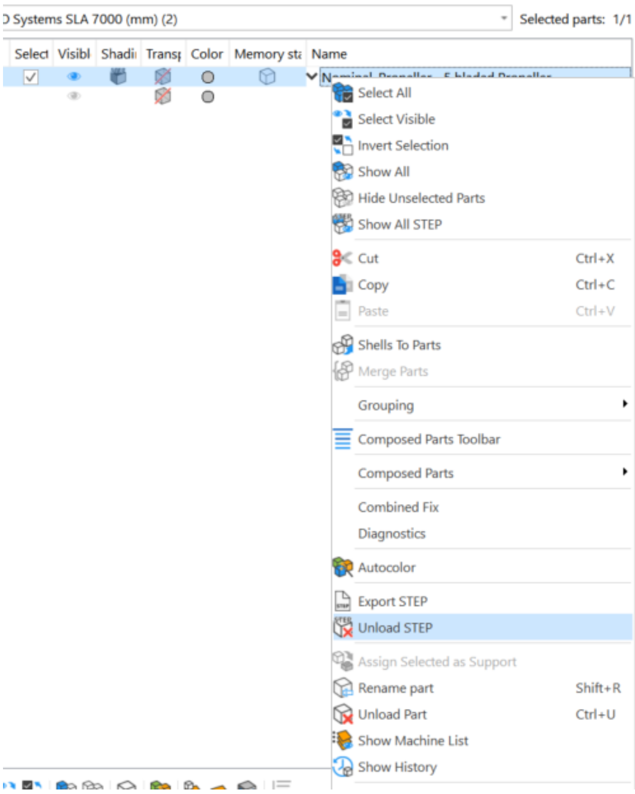



## 8.4 Modifying initial STEP

- When you perform any kind of translation or rotation under STL part, corresponded STEP will be changed accordingly;
- When you duplicate your STL, STEP also will be duplicated;
- When you fix your STL, modify it using fillet, chamfer, hollow, milling offset, perforator, extrude, structure or adding label or texture, corresponded STEP file keeps the same;
- When you want to rescale your STL part, make cut or create composed part, before the operation execution you will receive the following message:

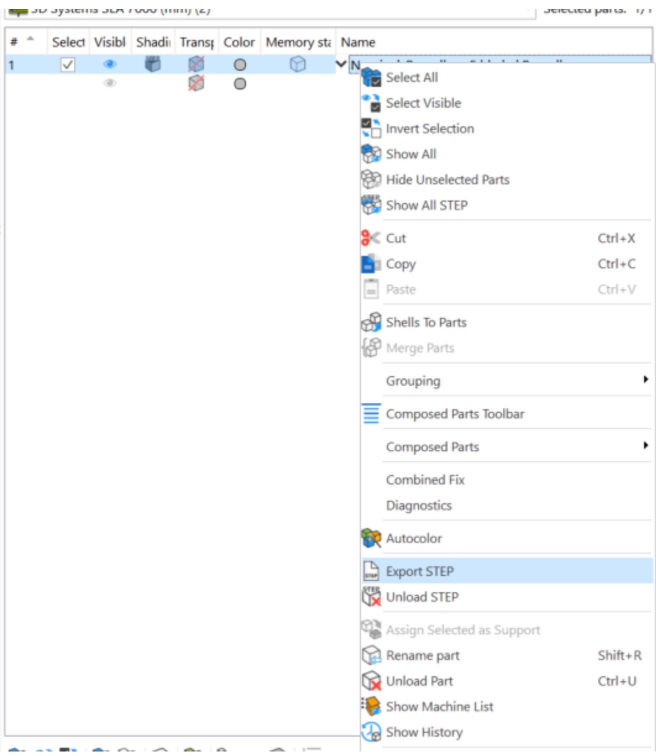



- Also you can delete your STEP using command Unload STEP:



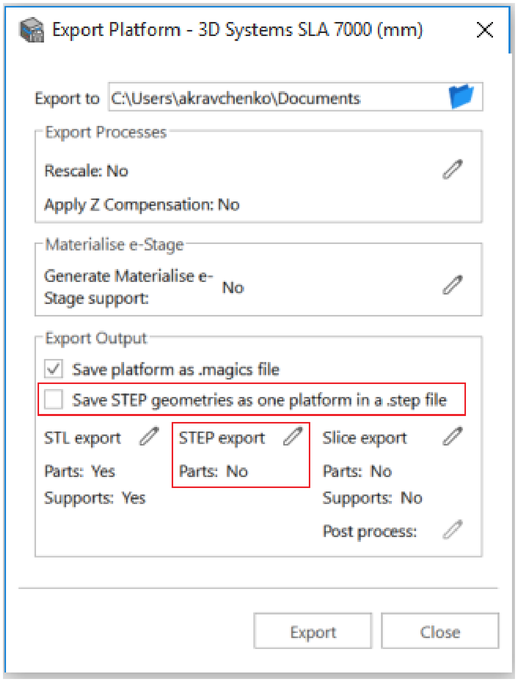

## 8.5 STEP export

- You can save your STEP part using command Export STEP:



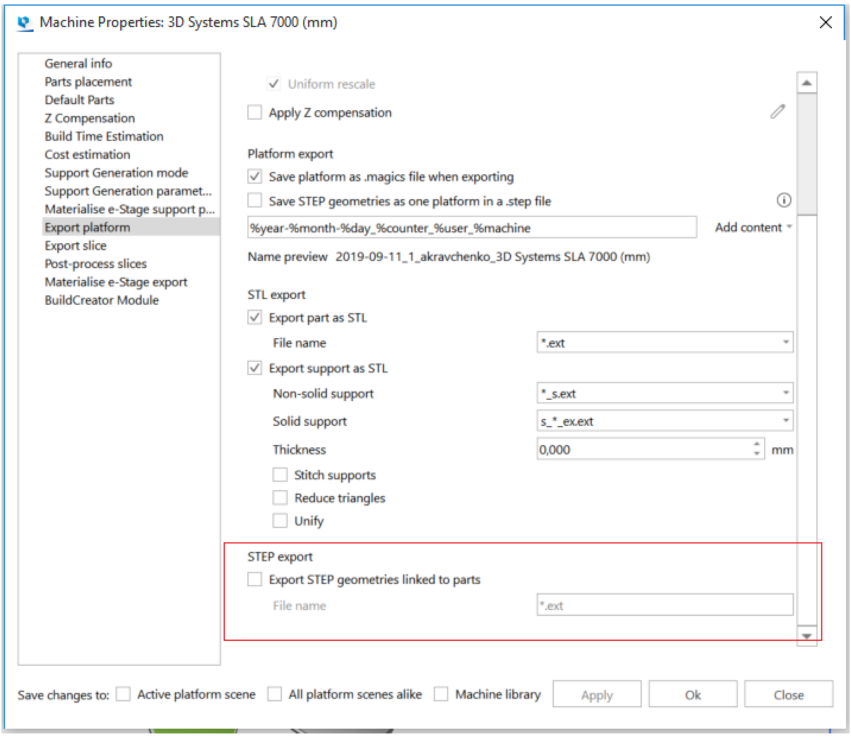

As an output you'll receive file with step extension which contains original STEP part with already applied transformation.

— Also you can receive step file during Export platform:




Save STEP geometries as one platform in a .step file – as an output you'll receive one STEP file which will contain all STEP geometries that are present on the scene.

— Export STEP geometries linked to parts – as an output you'll receive separate .step file for each part, which contains STEP.

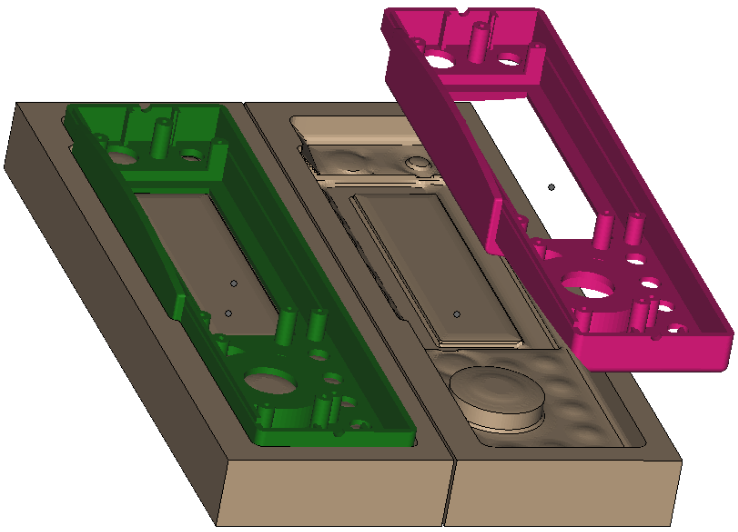


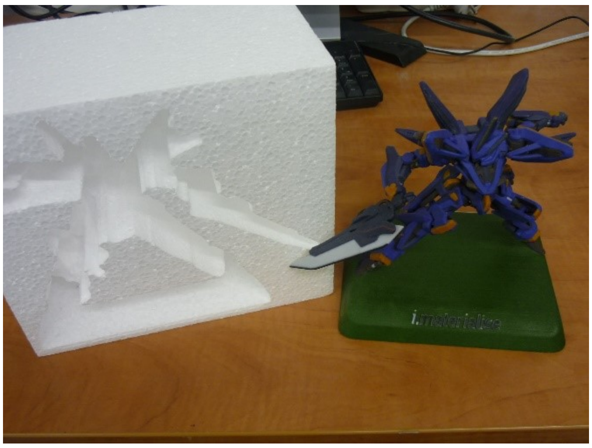
# 9 Chapter 9: Fit 2 Ship

## 9.1 FormFit

Very fragile parts (e.g. figurines) or large parts which can easily deform or get damaged during transport are often created with Additive Manufacturing. With the new FormFit function you can quickly create packaging files which can then be used to secure fragile, expensive, complex, large or unstable parts. The generated packaging file follows the shape of your object perfectly but avoids undercuts so that the stl file can be used to generate e.g. a foam which optimally supports your part.

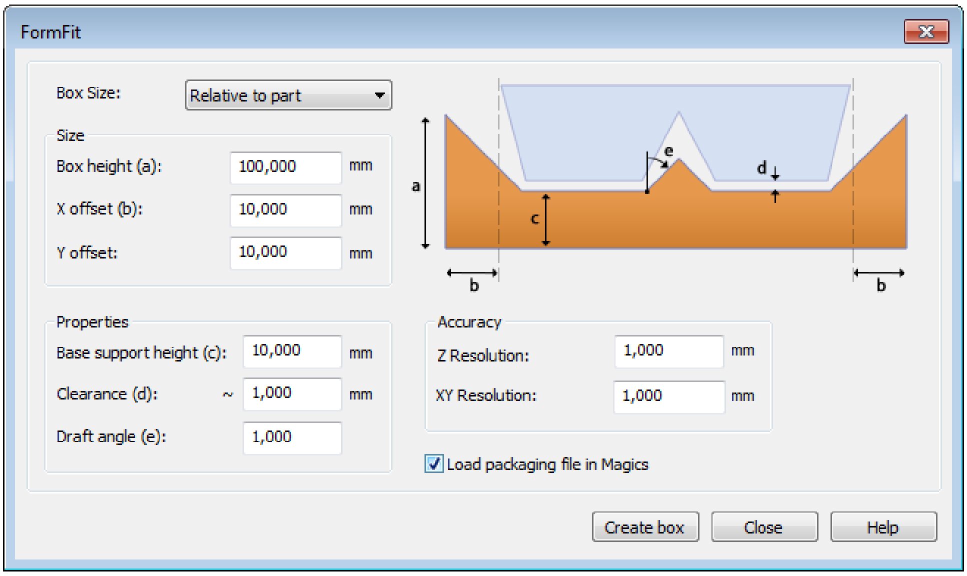
Two options are available to create a FormFit file: one in which the bounding box dimensions of the file are defined relative to the part (e.g. to have 50mm of surrounding material around the object) and one in which the dimensions are absolute (e.g. the file should fit a known shape).





### 9.1.1 Box Size: Relative to part

The outer dimensions of the FormFit-file are defined relative to part. The size of the box depends on the size of the part. Creating a box for multiple parts will let the box grow according to the selected parts.

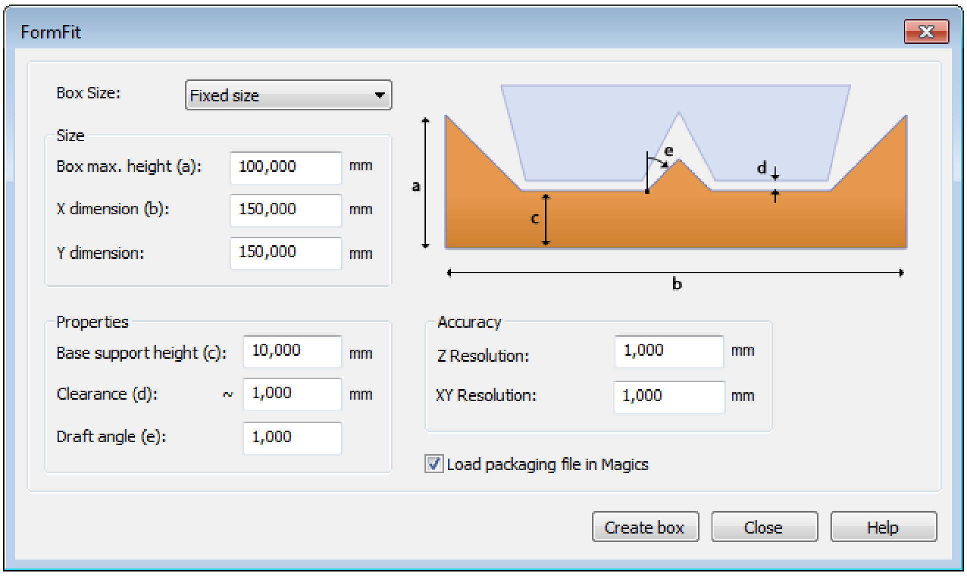



| | | |
|---|---|---|
| Size | Box height (a) | The absolute height of the generated FormFit file |
| | X offset (b) | The spacing between the generated FormFit file and the object in the X-dimension (should be larger than the XY resolution) |
| | Y offset | The spacing between the generated FormFit file and the object in the Y-dimension (should be larger than the XY resolution) |
| Properties | Base support height (c) | The absolute height of the FormFit file underneath the object |
| | Clearance (d) | The spacing between the generated FormFit file and the object in the Z-dimension. (should be larger than the Z resolution) |
| | Draft angle (e) | The draft angle determines the detail size. A large draft angle will not create a rough supporting file. A very small angle will perfectly follow the shape of the object. |
| Accuracy | Z resolution | The amount of detail used to do the calculation in the Z-direction. |
| | XY resolution | The amount of detail used to do the calculation in the X and Y-direction. |

| | |
|---|---|
| Load packaging file in Magics | If this option (standard on) is flagged then the FormFit file will be visualized in Magics after the calculation is finished. If this option is off then the file is only stored on a user determined location. |
| Create box | Activates the FormFit function and creates a file according to the set parameters. A screen will pop up asking the user whether he/she immediately wants to save the generated file to a folder. |

### 9.1.2 Box Size: Fixed size

Choosing the 'fixed size' option gives you the possibility to create a box with a fixed size, this can be useful when e.g. you would like to place the parts in a standard size carton box for transport.

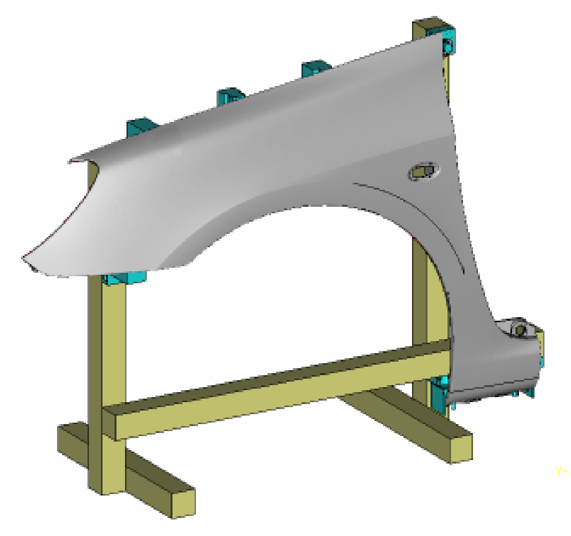



| | | |
|---|---|---|
| Size | Box max height (a) | The absolute height of the generated FormFit file |
| | Box width (b) | The absolute width of the FormFit file |
| | Box depth | The absolute depth (Y) of the FormFit file |
| Properties | | |
| | Base support height (c) | The absolute height of the FormFit file underneath the object |
| | Clearance (d) | The spacing between the generated FormFit file and the object in the Z-dimension. (should be larger than the Z resolution) |

| | | |
|---|---|---|
| | Draft angle (e) | The draft angle determines the detail size. A large draft angle will not create a rough supporting file. A very small angle will perfectly follow the shape of the object. |
| Accuracy | | |
| | Z resolution | The amount of detail used to do the calculation in the Z-direction. |
| | XY resolution | The amount of detail used to do the calculation in the X and Y-direction. |
| Load packaging file in Magics | If this option (standard on) is flagged then the FormFit file will be visualized in Magics after the calculation is finished. If this option is off then the file is only stored on a user determined location. | |
| Create box | Activates the FormFit function and creates a file according to the set parameters. A screen will pop up asking the user whether he/she immediately wants to save the generated file to a folder. | |

## 9.2 RapidFit

The automated solution for manufacturing operations and quality control on complex components. Quickly design cost-efficient fixtures to secure complex, large or unstable parts! Firmly positioned, these parts can then easily be checked, measured, machined, transported, glued or assembled. Speed and quality control are two of the biggest concerns in Rapid Prototyping. You can achieve both when creating and using Magics RapidFit fixtures. It’s the ideal solution for the design and setup of a support system for your parts.



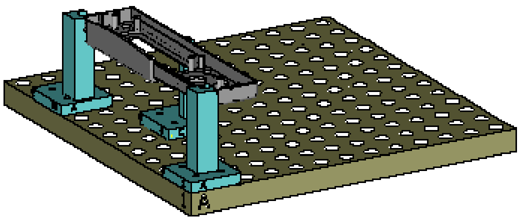
### 9.2.1 Introduction

Magics RapidFit software automatically designs fixtures based on your customized settings. It takes only a few steps:

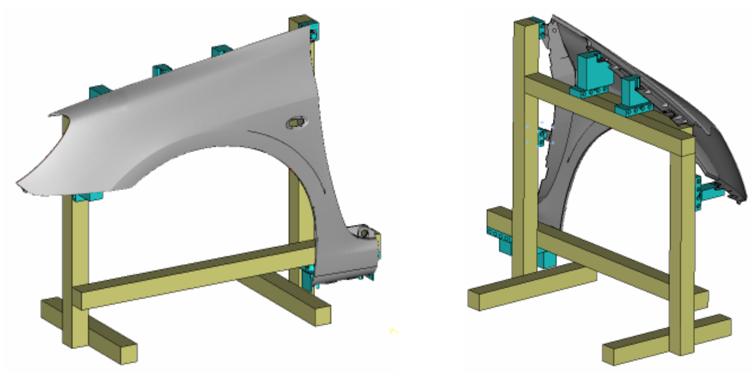
- Create the supporting system with base plates and/or beams
- Indicate on the part the contact points where the fixtures are needed
- Define the type of fixture (e.g. shape and orientation)
- Let Magics create the fixture automatically

The fixtures have a unique and well-defined fit: they will only fit to the part on the exact spots you've chosen. The fixtures are automatically labeled with the assembly position and the name of the parts. This doesn't only allow for setting up the system in no time, but also for easy identification, storage and reuse if required. Due to a very simple assembly method, the system is ready for use in a few minutes. The fixtures can be fixed quickly on a RapidFit reference plate or on beams of a fixture system. You can combine Magics RapidFit fixtures with modular fixture systems as the software can design fixtures that are compatible with any type of beam.

Once created, you can easily produce the fixtures with any RP technique. As RP technologies are functional and cost-effective, these are interesting techniques for fixture manufacturing. The fixtures can be built simultaneously with the part, which further increases your gain in time. The fixtures fit either on beams or on standard grids (baseplates).



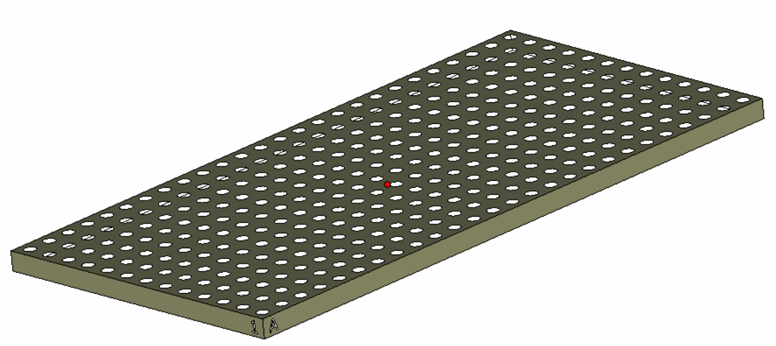
The following picture shows the placement of fixtures on a base plate.



We thus can distinguish 4 typical features in the RapidFit module: the part itself, the fixtures (supporting pillars for the part), the beams (supporting pillars for the fixtures) and/or the base plates (standard grids).

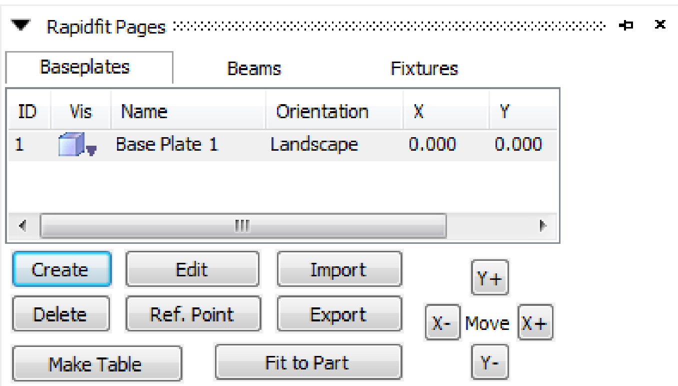
### 9.2.2 Base Plate

The base plate is a standard metal plate with a grid of threaded holes that can be bought or made. An example of a base plate is:



As you can see the sides of the plate are marked with '1' and 'A'. This is the coordinate system for the holes in the plate. It works just like the grid of a spreadsheet. The hole in the front is 'A1'. Each hole has a unique reference.

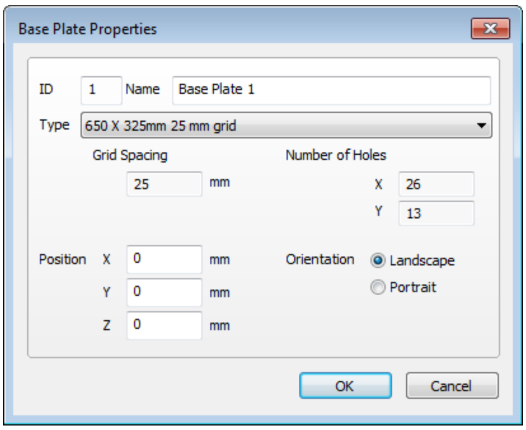
#### *9.2.2.1 The Base Plate Toolpage*




| List of Plates | | | |
|---|---|---|---|
| | ID | This is the ID of the base plate | |
| | Vis(ibility) |  | Hide the selected base plate. |
| | |  | Wireframe shows the edges of the selected base plate. |
| | |  | The selected base plate is showed in a combination of the shade-mode and the wireframe-mode. |

| | | |
|---|---|---|
| | Pos | Each Base Plate has a name that can be changed. If you use several base plates for one setup, they can be distinguished by their name. The default name is 'Base Plate' + ID |
| | Name | The orientation can be compared with Landscape and Portrait of a page setup in other programs |
| | X | X-position of the plate |
| | Y | Y-position of the plate |
| | Z | Z-position of the plate |
| Create | Creates a new item in the Base Plate list and leads you to the Base Plate Parameters dialog box | |
| Edit | Leads you to Base Plate Parameters dialog box | |
| Delete | Deletes the marked base plate from the list | |
| Ref. Point | Leads you to a small dialog box to change the X, Y and Z column of the list | |
| Import | This will import a bpd – file that contains a baseplate configuration. When you import an mrf-file, only the baseplates will be imported. | |
| Export | This will save the current baseplate setup as a bpd – file | |
| X+ | Moves the Base Plate over ‘gridsize’ in the positive X-direction. | |
| X- | Moves the Base Plate over ‘gridsize’ in the negative X-direction. | |
| Y+ | Moves the Base Plate over ‘gridsize’ in the positive Y-direction. | |
| Y- | Moves the Base Plate over ‘gridsize’ in the negative Y-direction. | |
| Make Table | You need to select the type of baseplate you want to use in the dialog box base plate table. | |
| Fit to Part | This wizard will make a baseplate setup which is adapted to the size of the particular part. You have to choose the type of baseplate. | |

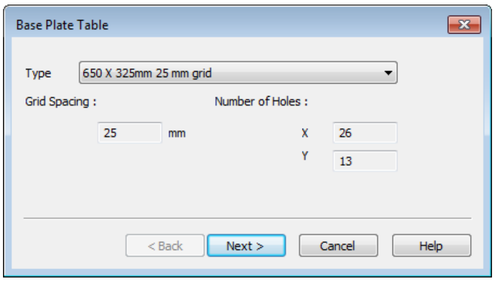
### 9.2.2.1.1 Base Plate Properties



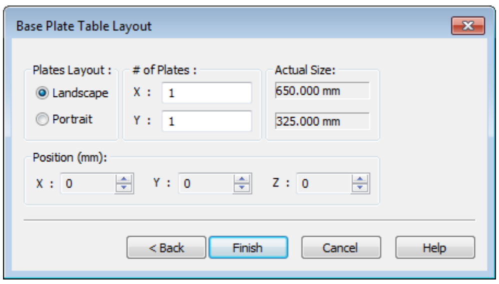
| | |
|---|---|
| ID | This is a unique number that represents the Base Plate. You cannot change it. |
| Name | The name is a string that has a default value 'Base Plate'+ ID. This name can be changed and you'll use this name for reference to the plate. |
| Type List | You choose a Plate Type out of the list, which is filtered in baseplates linked to the chosen grid size. The Base Plates are standardized. The type mentions the size of the plate in X and Y and also the Grid size. |
| Grid Spacing | The grid Parameter is a property of a Plate Type and can thus not be changed. It is the distance between the centers of the threaded holes. The distance between the side edge and the first row of holes is half the grid Parameter. Therefore the size of the plate is a multiple of this grid parameter. |
| Number of Holes | The Number of holes in the plate is the size (here 325) divided by the grid spacing (here 25). |
| Position | This is the position of the hole with lowest X and Y coordinate. |
| Orientation | The orientation can be compared with Landscape and Portrait of a page setup in other programs. |

### 9.2.2.1.2 Make Table

First you need to select the type of baseplate you want to use in the dialog box base plate table.

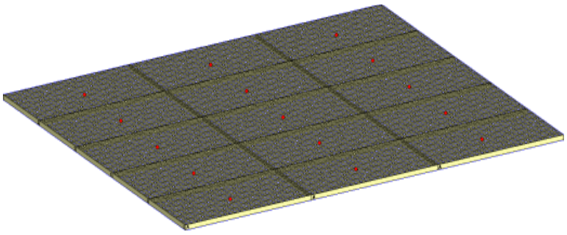



Then, the following dialog box pops up:



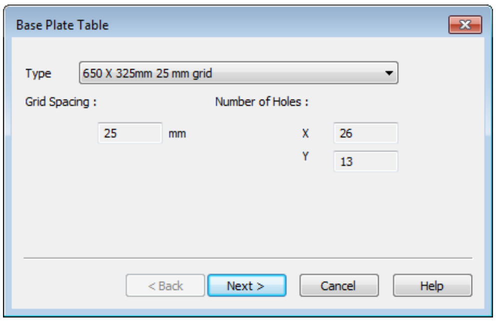
| | |
|---|---|
| Plates Layout | The user can choose whether to place the baseplates horizontal or vertical. |
| # of Plates | Enter here how much baseplates you want in the X and Y direction |
| Actual Size | Magics indicates the actual size of the chosen base plates |
| Position | Over here you can adapt the position of the setup (X, Y and Z position) |

When you press finish, Magics will create this setup. The baseplates are horizontal, 3 rows in the X-direction and 5 rows in the Y-direction.

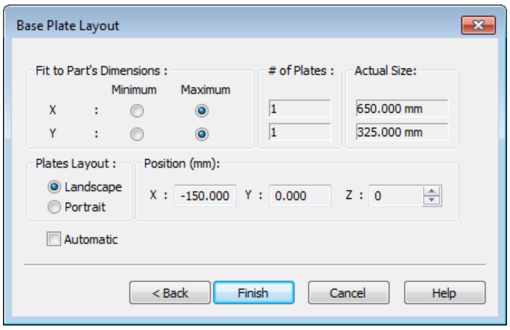


9.2.2.1.3 Fit to Part

This wizard will make a baseplate setup which is adapted to the size of the particular part. After having chosen the type of baseplate:

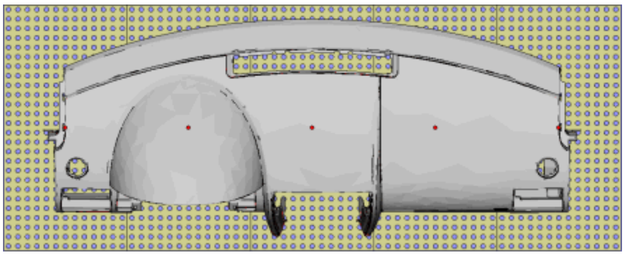



The following base plate layout dialog box pops up:




| | | |
|---|---|---|
| Fit to Part's Dimensions | Minimum | The setup will be a bit smaller as the part. |
| | Maximum | The setup will be bigger as the part. |
| # of Plates | Magics will show how much plates will be used in the X and Y-direction. | |
| Plates Layout | The user can choose whether to place the baseplates horizontal or vertical. | |
| Position | Over here you can adapt the position of the setup. | |
| Automatic | When automatic is selected, the plate layout will be chosen automatically so that the amount of baseplates is minimized. | |

As you can see in the following picture, Magics has automatically generated 5 baseplates to cover the whole part.



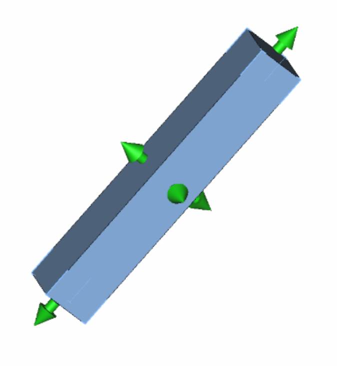
### 9.2.2.1.4 Pick & Place Base Plates

 You can also move the baseplates by dragging the baseplates. Select the baseplates you want to move by clicking on the tags or by drawing a rectangle around the tags. Move the cursor to the center of the baseplate indicated by the red dot, hold the left mouse button and move the baseplates in the XY plane.

## 9.2.3 Beam

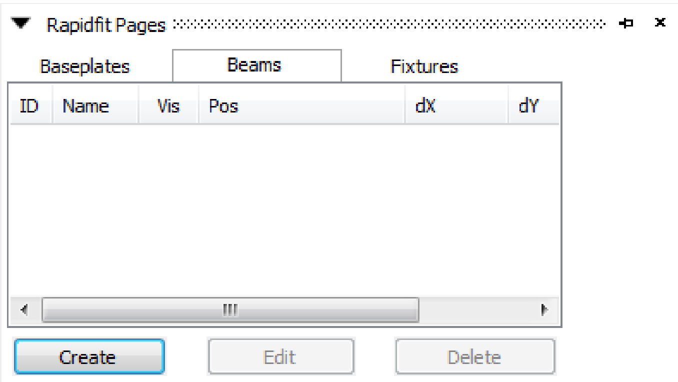
A beam is a post that can replace the baseplates or be added to the setup with baseplates. Fixtures can be attached to these beams. The advantage of the beams is the possibility of placement in the X, Y and Z direction.

A beam looks like:



The picture clearly shows the arrows on each side of the beam. With those arrows, both the position as the size of the beam can be changed. This will be discussed in more detail at Pick & Place & Edit.

### *9.2.3.1 The Beams Toolpage*




| List of Beams | | | |
|---|---|---|---|
| | ID | The ID of the beam. | |
| | Name | Each beam has a name that can be changed. If you use several beams, they can be distinguished by their name. The default name is Beam + ID | |
| | Vis(ibility) |  | Hide the selected beam. |
| | |  | The beam is displayed with shades according to the direction of the triangles. |



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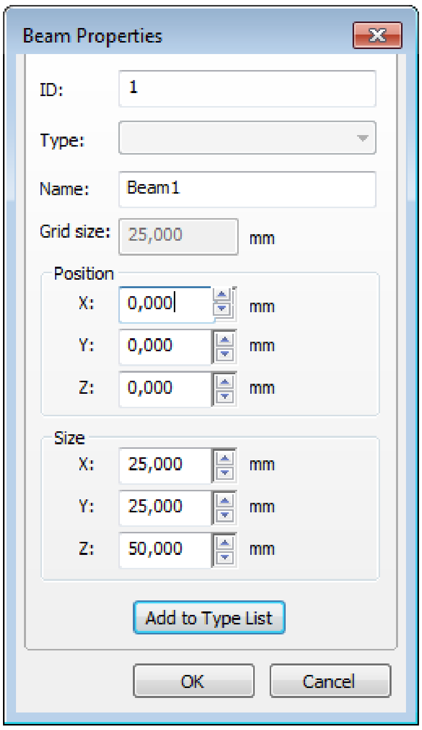
| | | | |
|---|---|---|---|
| | | | Wireframe shows the edges of the selected beam. |
| | | | The selected beam is showed in a combination of the shade-mode and the wireframe-mode. |
| | | | The triangles of the beam will be displayed. |
| | | | The bounding box of the beam is showed. |
| | Pos | The (x, y, z) position where the beam will appear after creation. | |
| | dX | The length of the beam in the X direction. | |
| | dY | The length of the beam in the Y direction | |
| | dZ | The length of the beam in the Z direction | |
| Create | Click on the button *create* in order to create a new beam. The dialog box Beam Properties appears. | | |
| Edit | If you highlight a row in the Beams Toolpage and you click on edit, the Beam Properties dialog box appears in order to edit the selected beam. | | |
| Delete | To delete a selected (highlighted) beam. | | |

### 9.2.3.1.1 Beam Properties

There are 2 ways to change the properties of a beam. After creation you can either use the following dialog box, or you can use the 'Pick and Place beams mode' (arrows attached to the beam).



| | |
|---|---|
| ID | The ID of the beam. |
| Type List | One can also chose predefined types of beams (particular size) from the type list. |
| Name | Beam |
| Grid Size | The Grid Size of the Base Plate. The Grid Size indicates the step of the movement on the base plate. |
| Position | The (x, y, z) position where the beam will appear. |
| Size | The size of the beam. |
| Add to Type List | If the user wants to work with a self-defined type of beam, a particular size (of a beam) can be saved by clicking Add to Type List and giving a name to the newly created type. |

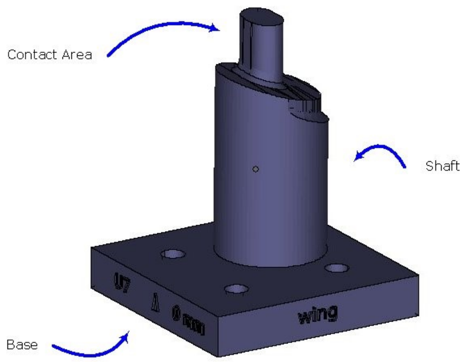
#### 9.2.3.1.2 Pick & Place & Edit

The position and size of the can be changed by using the Pick & Place & Edit mode. First enter the mode, then click on the beam (CTRL+click in order to select more than one beam). There are 3 possible actions:

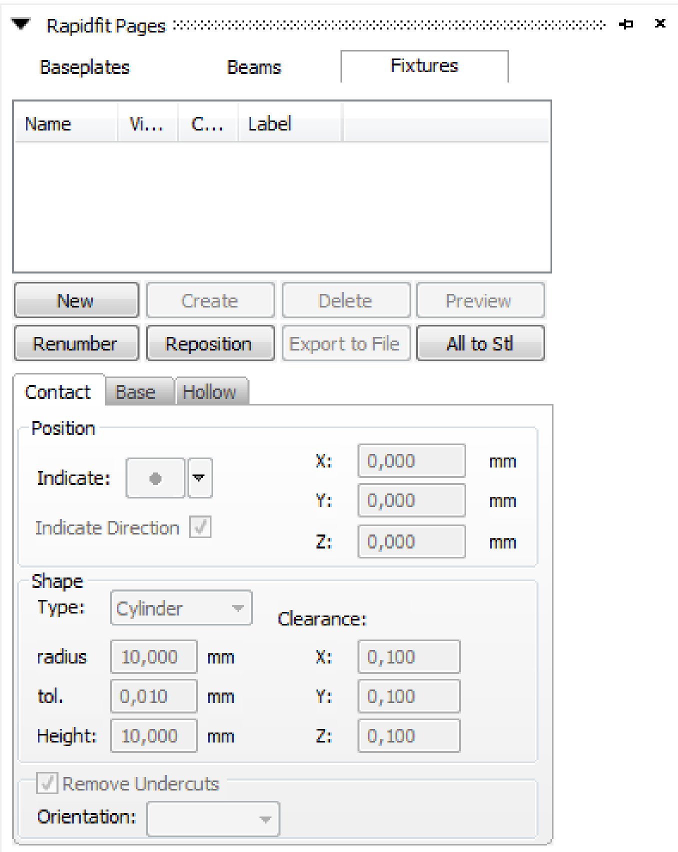
| | | |
|---|---|---|
| Drag | | After selecting the beam, go to the arrow indicating the desired direction and move the beam in the desired direction. You can pull or push the beam. |
| Resize | | By clicking CTRL+left click mouse on arrow and moving in the desired direction, the beam will be resized. |
| Rotate | | By clicking SHIFT+left click mouse on arrow, the beam will rotate 90° around the arrow. |

### 9.2.4 Fixture

The fixture is the pillar that is created to support and hold the part. A fixture looks like:




### 9.2.4.1 The Fixtures Toolpage

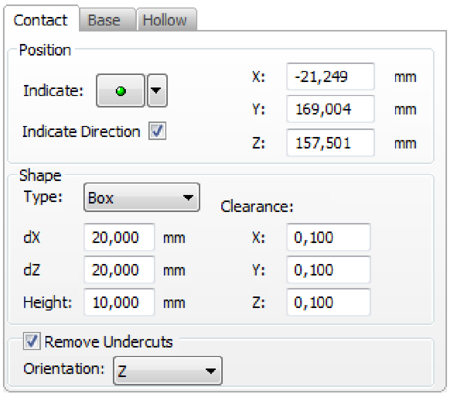


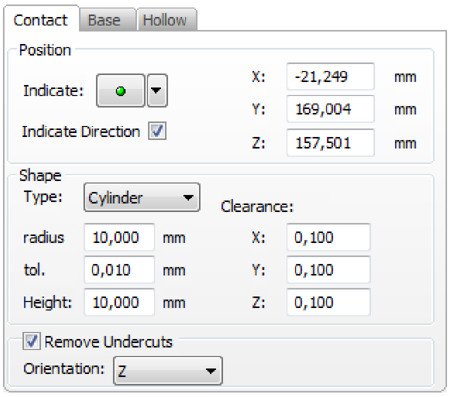

| | | | |
|---|---|---|---|
| List of Fixtures | | | |
| | Name | This is the name of the fixture. It helps the user to see which fixture is manipulated. | |
| | Visible |  | Hide the selected fixture. |
| | |  | The fixture is displayed with shades according to the direction of the triangles. |

| | | | |
|---|---|---|---|
| | | | Wireframe shows the edges of the selected fixture. |
| | | | The selected fixture is showed in a combination of the shade-mode and the wireframe-mode. |
| | | | The triangles of the fixture will be displayed. |
| | | | The bounding box of the fixture is showed. |
| | Color | The circle shows the color of the fixture. Clicking on this circle and selecting a different color can change the color. | |
| | Label | This is the label that will appear on the base of the fixture. By default, this is the part name but it can be changed to the name of an assembly, a project or whatever. | |
| New | To create a new fixture. | | |
| Delete | To delete the selected fixture. | | |
| Create | Magics will create the selected beam so you can study it in its final form. | | |
| Preview | This button refreshes the preview of the fixtures on the screen. | | |
| Renumber | This button renumbers your fixtures should you have a list, in which fixtures have been created and deleted. | | |
| Reposition | Reposition recalculates the position of the fixture. Suppose that the base of the fixture has been moved away from the shaft or a beam has been replaced and the fixture isn't connected anymore to the beam, than Reposition solves these problems. | | |
| Export to File | This button prompts the user to save the beam as an STL file hence an automatic conversion will be done. The user thus can enter the name and the path in order to save an STL-file of this fixture. | | |

### *9.2.4.2 Contact Properties*

These are the properties of the Contact (the upper side of the pillar). The contact tab deals with the position, the shape and the removal of undercuts of the contact.

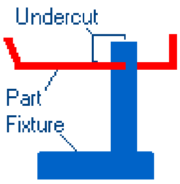


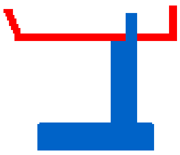

| | | |
|---|---|---|
| Position | Indicate | With indicate which point, point on wireframe or which center of a circle to use as a center of the contact. After clicking by mouse, the parameters (X, Y, Z) can be used to make the position round numbers. |
| | Indicate Direction | If the user selects the function ‘indicate direction’, upon indicating to point of contact an arrow will appear with which the user can direct in which direction the base will have to be attached to a beam or a baseplate. |
| | X | X-position of the contact. |
| | Y | Y-position of the contact. |
| | Z | Z-position of the contact. |
| Shape | Type | Shape of the contact. It can be a box or a cylinder. |
| | dX | X dimension of the box-contact (will change depending of orientation). |
| | dY | Y dimension of the box-contact (will change depending of orientation). |
| | Radius | The radius of the cylinder-contact. |
| | Tolerance | The tolerance of the STL representation of the cylinder-contact. |
| | Height | Extra height of the contact. The contact is automatically as high as the distance from the base plate until the part This height is added to that distance. |
| | Clearance | This allows the user to define some clearance. A 4 mm pin never fits in a 4 mm hole. Thus the pin will be a bit smaller or the hole a bit bigger. When we say a bit, we don't think of 1 mm but rather of 0.01 mm. This 0.01 mm is the clearance. |
| Remove Undercuts | Indicate whether you want to remove undercuts and in which direction. | |

#### 9.2.4.2.1 Remove Undercuts

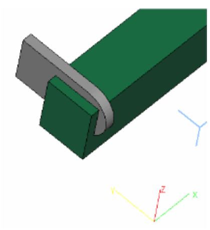
If we take a short look on a section of an assembly of part and fixture we see:

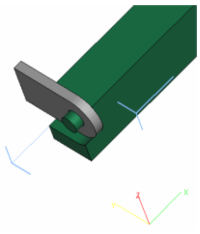



or without the undercut



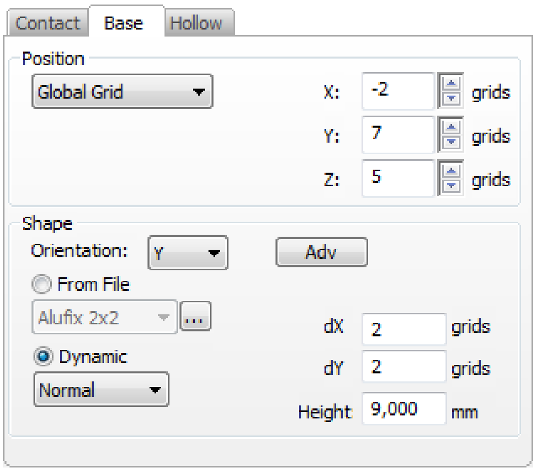
Thus you can see that a fixture with a big undercut cannot be taken out of the part. In the combo box, the user can choose the orientation (X, -X, Y, -Y, Z, -Z) of the undercut removal.

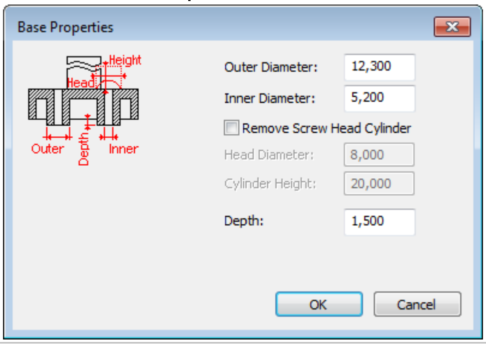




| | |
|---|---|
| Undercut removal in Z direction for insertion of the part from above. | Undercut removal in -X direction for insertion of the part from the side. |

### 9.2.4.3 Base Properties

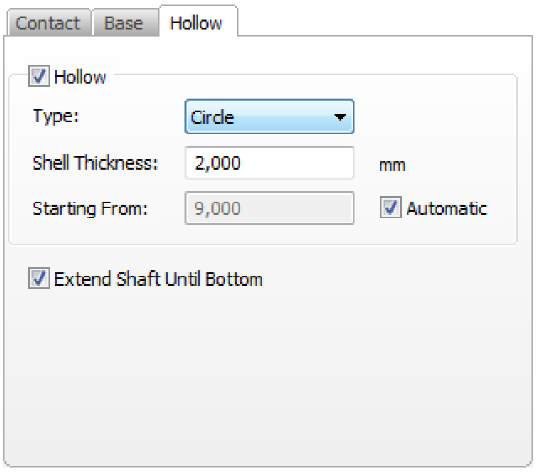



<table>
<tr><td rowspan="4">Position</td><td>Global Grid</td><td colspan="2">The fixture is placed on the global grid.</td></tr>
<tr><td>X</td><td colspan="2">X position in grids.</td></tr>
<tr><td>Y</td><td colspan="2">Y position in grids.</td></tr>
<tr><td>Z</td><td colspan="2">Z position in grids.</td></tr>
<tr><td rowspan="3">Shape</td><td>Orientation</td><td colspan="2">The user can choose the orientation of the base. This indicates the direction of the fixtures (X, -X, Y, -Y, Z, -Z). This setting is related with the indicate direction feature (See )</td></tr>
<tr><td></td><td colspan="2">Advanced base properties. These give you more freedom for the design of the base, especially concerning the placement of the base on the base plate.<br></td></tr>
<tr><td>From file</td><td colspan="2">You can now create fixtures that will fit on every system by using STL-bases. When a base is not in the drop down list, you can add a base by using the ... – button.<br>Create the wanted beam in the STL format, save the file so that the WCS is in the bottom corner of the STL.</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Dynamic</td><td>Type</td><td>The user can choose from the combo box: normal, caps, Rexroth</td></tr>
<tr><td>dX</td><td>X dimension in grids.</td></tr>
</table>

| | | | |
|---|---|---|---|
| | | dY | Y dimension in grids |
| | | Height | The height of the base of the fixture. |

### 9.2.4.4 *Hollow Properties*

Dependent on how the fixtures are made it can be useful to make them hollow. When they are made with Stereolithography or LS, the Hollow version is a gain of time.

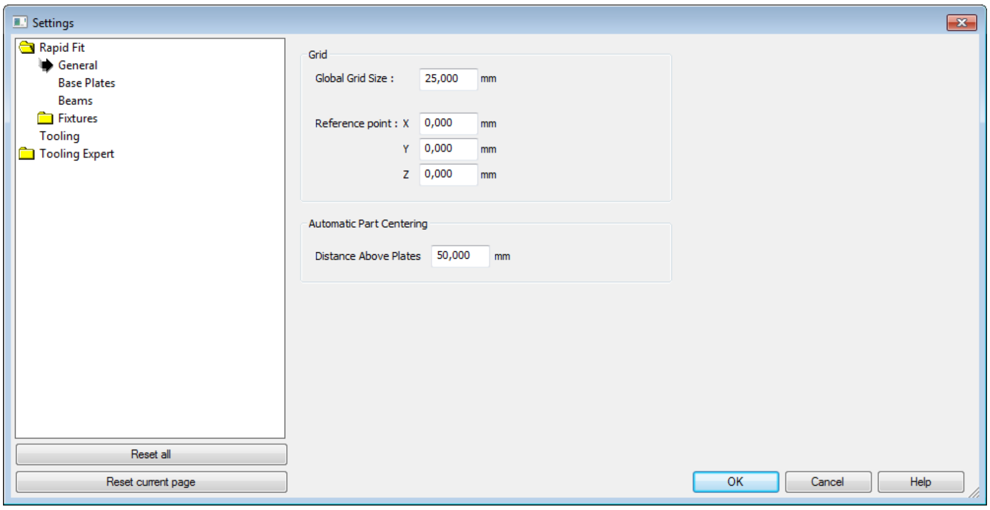



| | |
|---|---|
| Hollow | Make the fixture hollow or not. |
| Type | The inner shape can be a circle or a square independent of the outer shape. |
| Shell Thickness | The thickness of the wall. |
| Starting from | This can be automatic (check-box). Then the fixture is hollow until a certain height. That height is a 'shell thickness' away from the position of the contact. If you wish, you can enter a height manually by checking off the Automatic check box and entering the height in the Starting from edit box. |
| Extend shaft | To improve the stability of the shaft, you can extend it to the bottom so it will make contact with the base plate. |

## 9.2.5 Settings

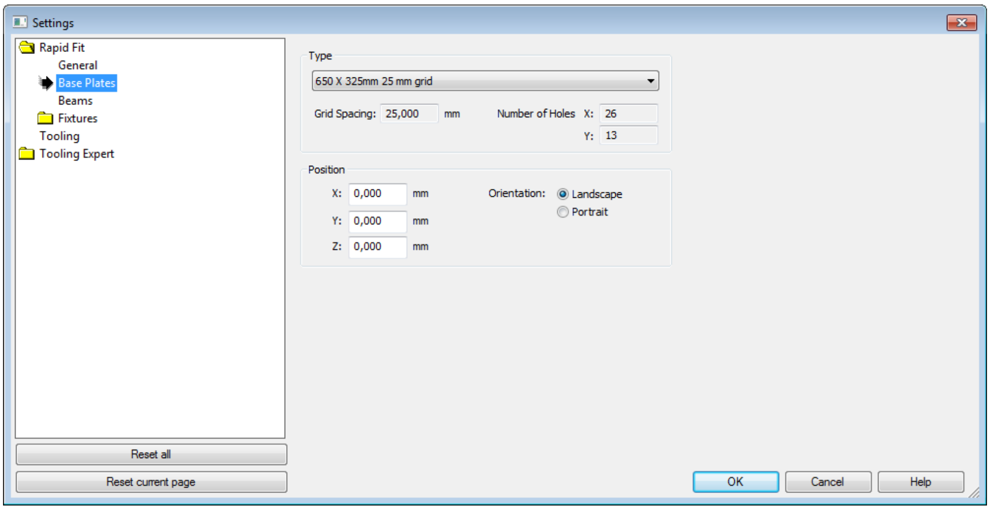
Here, the user is able to define the default properties of RapidFit. To reach the Settings of RapidFit go to Menubar/Options/Settings/Modules/RapidFit

### 9.2.5.1 General



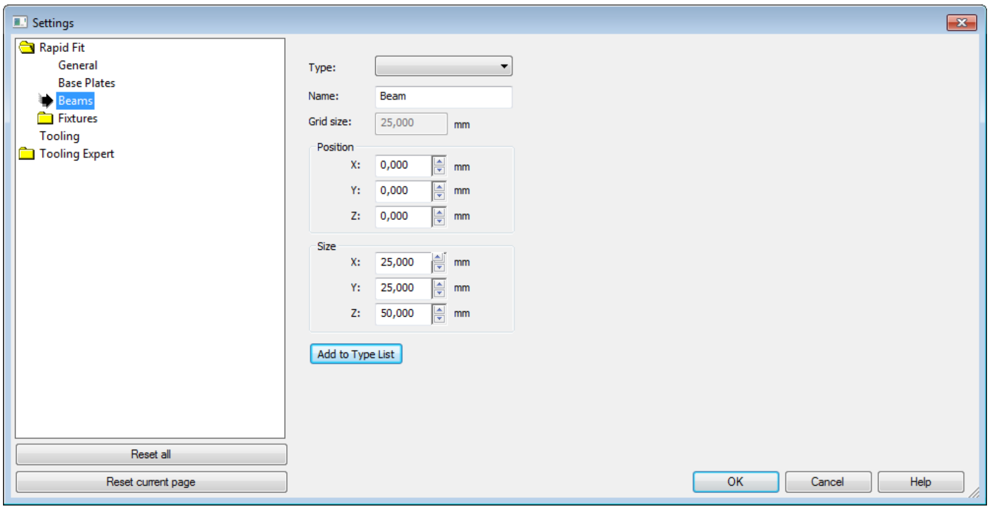

| | | |
|---|---|---|
| Grid | One should know that there is a difference between the grid and the base plate. The grid, of which the reference point can be predefined in this General tab of the Settings, is virtual. You can imagine an infinite series of circles in x and y. | |
| | Global Grid Size | The distance between the centers of these circles of the grid. |
| | Reference Point | The Reference point is the position of the center point of one of the circles. When you make a new Base Plate, it will start from the circle on the reference point and extend in the positive x- and y-direction. |
| Automatic Part Centering | Distance Above Plates | Magics will translate the part centered above the platforms. The distance used between the part and the plates will be the given height Distance Above Plates in this menu. |

### 9.2.5.2 Base Plates




| | | |
|---|---|---|
| Type | This is the type of Base Plate. The drop – down menu lets you choose between existing Base Plates. They are filtered on the selected grid size. | |
| | Grid Spacing | The distance between the centers of these circles of the grid. |
| | Number of Holes | The amount of holes of the Base Plate. |
| Position | X Y Z | The position of the base plates can be altered but only with reference to this grid, hence only in steps that are a multiple of the grid size. |
| | Orientation | The orientation plays the role of Portrait and Landscape in a print Setup of any program. If you use it on a square shaped Base Plate, only the text at the sides of the plate will tell you that you changed the orientation. |

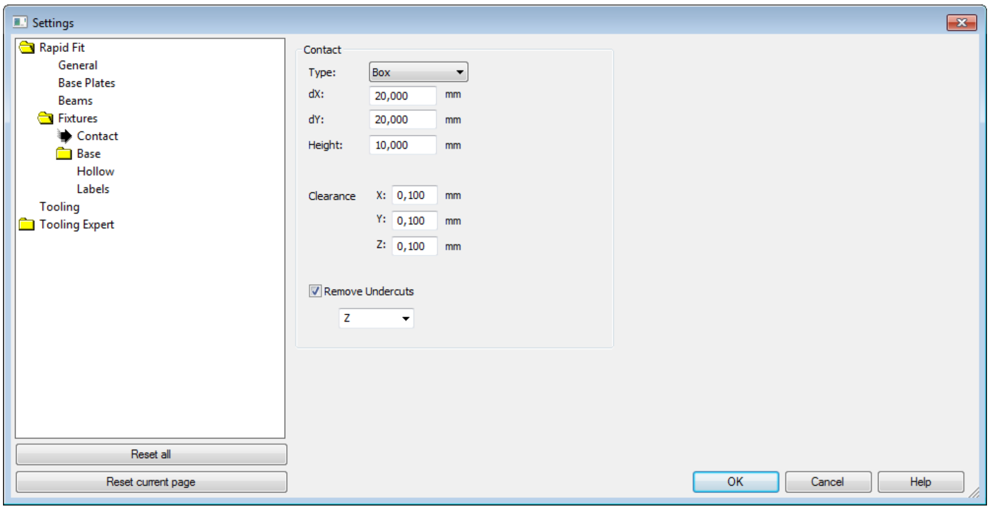
### *9.2.5.3 Beams*

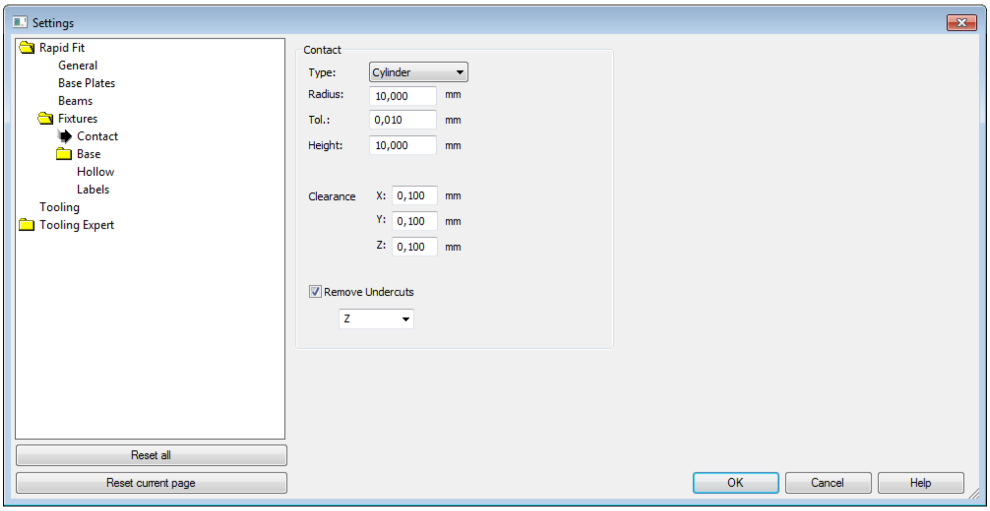



| | |
|---|---|
| Type List | One can also chose predefined types of beams (particular size) from the type list. |
| Name | The name of the beam. |
| Grid Size | The Grid Size of the Base Plate. The Grid Size indicates the step of the movement on the base plate. |
| Position | The (x, y, z) position where the beam will appear. |
| Size | The size of the beam. |
| Add to Type List | If the user wants to work with a self-defined type of beam, a particular size (of a beam) can be saved by clicking Add to Type List and giving a name to the newly created type. |

## 9.2.6 Fixtures

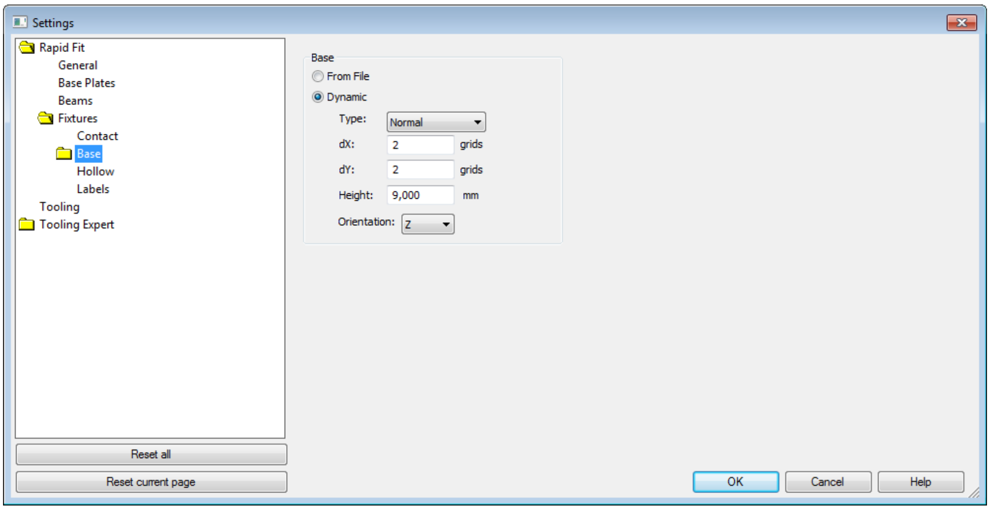
### *9.2.6.1 Contact*





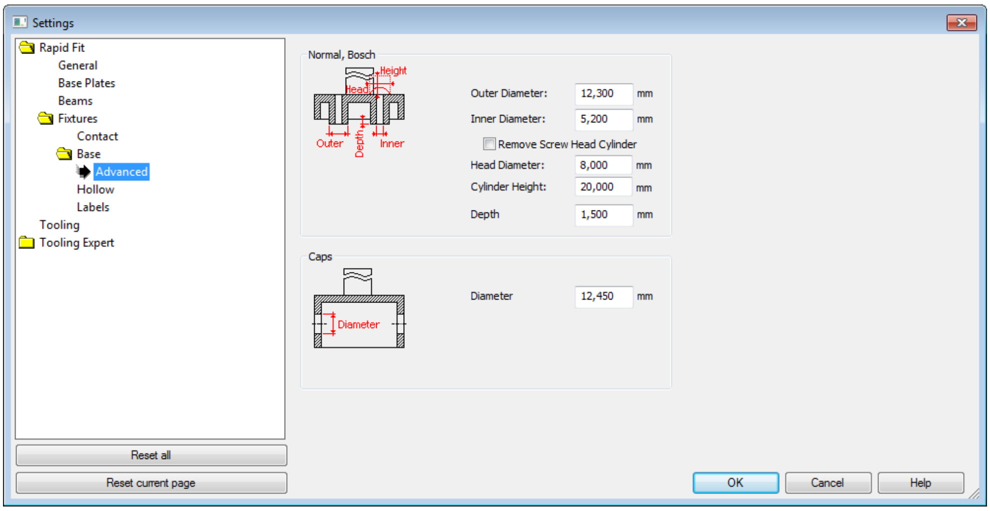

| | |
|---|---|
| Type | Shape of the contact. It can be a box or a cylinder. |
| dX | X dimension of the box-contact (will change depending of orientation). |
| dY | Y dimension of the box-contact (will change depending of orientation). |
| Radius | The radius of the cylinder-contact. |
| Tolerance | The tolerance of the STL representation of the cylinder-contact. |
| Height | Extra height of the contact. The contact is automatically as high as the distance from the base plate until the part This height is added to that distance. |
| Clearance | This allows the user to define some clearance. A 4 mm pin never fits in a 4 mm hole. Thus the pin will be a bit smaller or the hole a bit bigger. When we say a bit, we don't think of 1 mm but rather of 0.01 mm. This 0.01 mm is the clearance. |
| Remove Undercuts | Indicate whether you want to remove undercuts and in which direction. |

### 9.2.6.2 Base



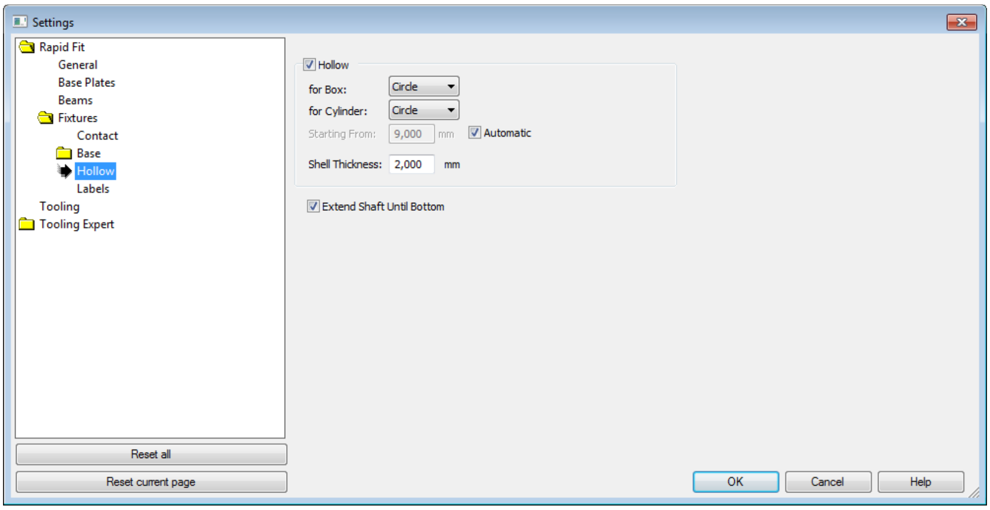

| | | |
|---|---|---|
| From file | You can now create fixtures that will fit on every system by using STL-bases. | |
| Dynamic | Type | The user can choose from the combo box: normal, caps, Rexroth |
| | dX | X dimension in grids. |
| | dY | Y dimension in grids |
| | Height | The height of the base of the fixture. |
| | Orientation | The user can choose the orientation of the base. This indicates the direction of the fixtures (X, -X, Y, -Y, Z, -Z). This setting is related with the indicate direction feature (See ) |

#### 9.2.6.2.1 Advanced



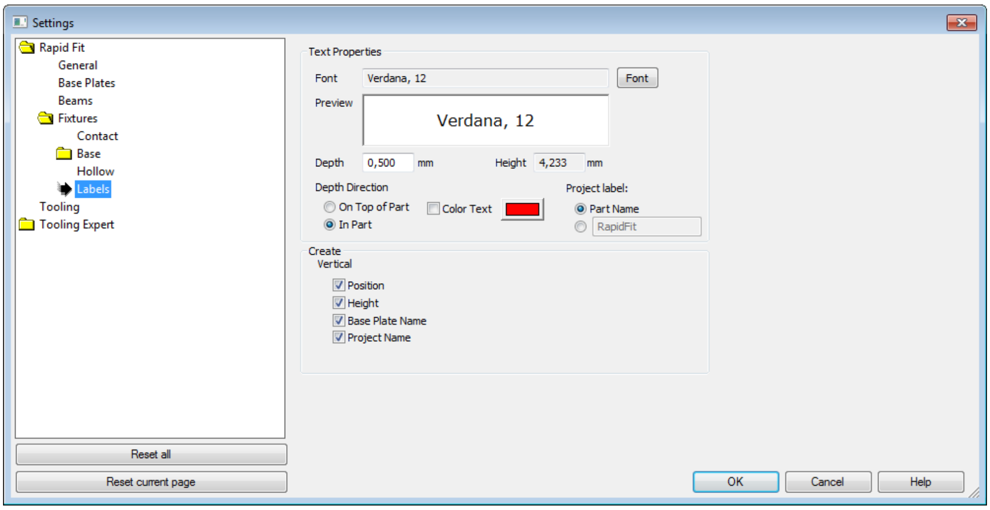
| | |
|---|---|
| Normal Bosch | These properties give you more freedom for the design of the base, especially concerning the placement of the base on the base plate. |
| Caps | These properties give you more freedom for the design of the caps. |

### *9.2.6.3 Hollow*




| | |
|---|---|
| Hollow | Make the fixture hollow or not. |
| For Box | The inner shape can be a circle or a square. |
| For Cylinder | The inner shape can be a circle or a square |
| Starting from | This can be automatic (check-box). Then the fixture is hollow until a certain height. That height is a 'shell thickness' away from the position of the contact. If you wish, you can enter a height manually by checking off the Automatic check box and entering the height in the Starting from edit box. |
| Shell Thickness | The thickness of the wall. |
| Extend shaft | To improve the stability of the shaft, you can extend it to the bottom so it will make contact with the base plate. |

### *9.2.6.4 Labels*




| | | |
|---|---|---|
| Text Properties | Font | The user can define the font of the labels. |
| | Preview | A preview is given of the chosen font. |
| | Depth | The depth of the label |
| | Height | The height of the text. |
| | Depth Direction | The text can be directed out of the base or into the base. |
| | Color Text | Colors the text of the label. |
| | Project Label | Displays the part name or a name defined by the user. |
| Create | Vertical | Displays the checked items on the base of the fixture. |

## 9.2.7 File Operations

The information of this module can be stored in a Magics Project File.

## 9.2.8 Tools

### *9.2.8.1 Center Part(s)*

The loaded part(s) are centered on the base plates.

### 9.2.9 Document Generation

The document generation, as explained before (The reader is referred to the Manual of Magics Base for further information on the topic of Document Generation), can also be used to generate reports of the rapid fit set-ups. These are the additional fields for documenting the RapidFit setups.

#### *9.2.9.1 General RapidFit tags*

| | |
|---|---|
| RapidFitProjectName | The name of the RapidFit file |
| RapidFitGridSize | The gridsize used (=distance between holes, default 25mm) |
| RapidFitGridSizeZ | If applied, the gridsize in the Z direction |
| BasePlatesRefPoint | The reference point of the baseplate setup |
| BasePlatesSetupXDimension | The X dimension of the total baseplate setup |
| BasePlatesSetupYDimension | The Y dimension of the total baseplate setup |
| BasePlatesSetupZDimension | The Z dimension of the total baseplate setup |
| BasePlatesSetupDimensions | The total dimensions of the total baseplate setup |
| FixturesBoundingBoxDimensions | The dimensions of the bounding box of all the fixtures |

The Setup View allows inserting a picture of the complete set-up.

#### *9.2.9.2 Baseplate Tags*

These tags are to represent the information of the baseplates. In case of using multiple baseplates, this information will be repeated once for each baseplate. To achieve this, the tags must be placed into a table. Magics will repeat this information in the table for each baseplate.

| | |
|---|---|
| BasePlateID | The ID number of the baseplate |
| BasePlateName | The name of the baseplate |
| BasePlateNumHolesX | The amount of holes in the X direction |
| BasePlateNumHolesY | The amount of holes in the Y direction |
| BasePlateOrientation | The orientation of the baseplate (horizontal or vertical) |
| BasePlatePositionX | The X position of the baseplate |
| BasePlatePositionY | The Y position of the baseplate |
| BasePlatePositionZ | The Z position of the baseplate |

Pictures of the base plates can be inserted via the *Base Plate View* part of the Materialise menu in the insert menu of Word.

### 9.2.9.3 Beam Tags

These tags are to represent the information of the beams. In case of using multiple beams, this information will be repeated once for each beam. To achieve this, the tags must be placed into a table. Magics will repeat this information in the table for each beam.

| | |
|---|---|
| BeamID | The ID number of the beam |
| BeamName | The name of the beam |
| BeamPositionX | The X position of the beam |
| BeamPositionY | The Y position of the beam |
| BeamPositionZ | The Z position of the beam |
| BeamDimensions | The dimensions of the beam |
| BeamSizeX | The X-dimension of the beam |
| BeamSizeY | The Y-dimension of the beam |
| BeamSizeZ | The Z-dimension of the beam |

Pictures of the beams can be inserted via the Beams View part of the Materialise menu in the insert menu of Word.

### 9.2.9.4 Fixture tags

| | |
|---|---|
| FixtureName | The name of the fixture |
| FixtureGridPositionX | The X position of the fixture relative to the baseplate |
| FixtureAbsPositionX | |
| FixtureGridPositionY | The Y position of the fixture relative to the baseplate |
| FixtureAbsPositionY | |
| FixtureGridPositionZ | The Z position of the fixture relative to the baseplate |
| FixtureAbsPositionZ | |
| FixtureGlobalPositionX | The global X position of the fixture (using the origin as 0) |
| FixtureGlobalPositionY | The global Y position of the fixture (using the origin as 0) |
| FixtureGlobalPositionZ | The global Z position of the fixture (using the origin as 0) |
| FixtureBoundingBoxDimensions | The bounding box dimensions of the fixture |
| FixtureOwningPlateID | The ID of the baseplate on which the fixture is put |
| FixtureOwningPlateName | The name of the baseplate on which the fixture is put |

| | |
|---|---|
| FixtureClearanceX | The clearance used in X |
| FixtureClearanceY | The clearance used in Y |
| FixtureView | |

Pictures of the fixtures can be inserted via the Fixtures View part of the Materialise menu in the insert menu of Word.

# Part IV: Extra Information

# 1 Chapter 1: Recommended System Requirements

## 1.1 Hardware

***CPU***

— Intel® Core i7/AMD Athlon™ (Phenom II X4 / X6) multi-core processors 3.0 GHz or higher with SSE2 technology

***Memory***

— 16 GB RAM or higher

***Free Disk Space***

— Win 64-bit system
— 2GB of free disk space for Windows 64-bit (.NET Framework 4.5 or later)

***Display***

— 1920 x 1080 resolution or higher
— 32-bit color depth (True color)

***Video Card***

— GPU chip: NVIDIA GeForce GTX 1060, AMD Radeon RX 480 or better
— DirectX 11 compatible video card
— 1 GB of memory (more is recommended)
— Memory interface width of 192-bit (256-bit is recommended)

## 1.2 Operating Systems

Materialise Magics[25] is only supported on Windows 64-bit:

— Windows 10
— Windows 8 / 8.1

The following Windows editions are recommended:

— Windows Pro edition
— Windows Enterprise edition

Materialise Magics[25] is not supported on following systems:

— Windows 98
— Windows 2000
— Windows XP Home

- Windows XP Pro SP3 (32bit/ 64bit)
- Windows Vista
- Windows Server Editions
- Windows 7

Materialise Magics does not run natively on Mac OS X, Linux, or any other operating system not listed above.

KB2999226 Windows update is required to be installed for SketchUp 2017 import.

Virtualization systems such as VMWare are not recommended.

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