

EGALWARE SRL



Egalware

User Manual

ICARUS SOFTWARE

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Premise

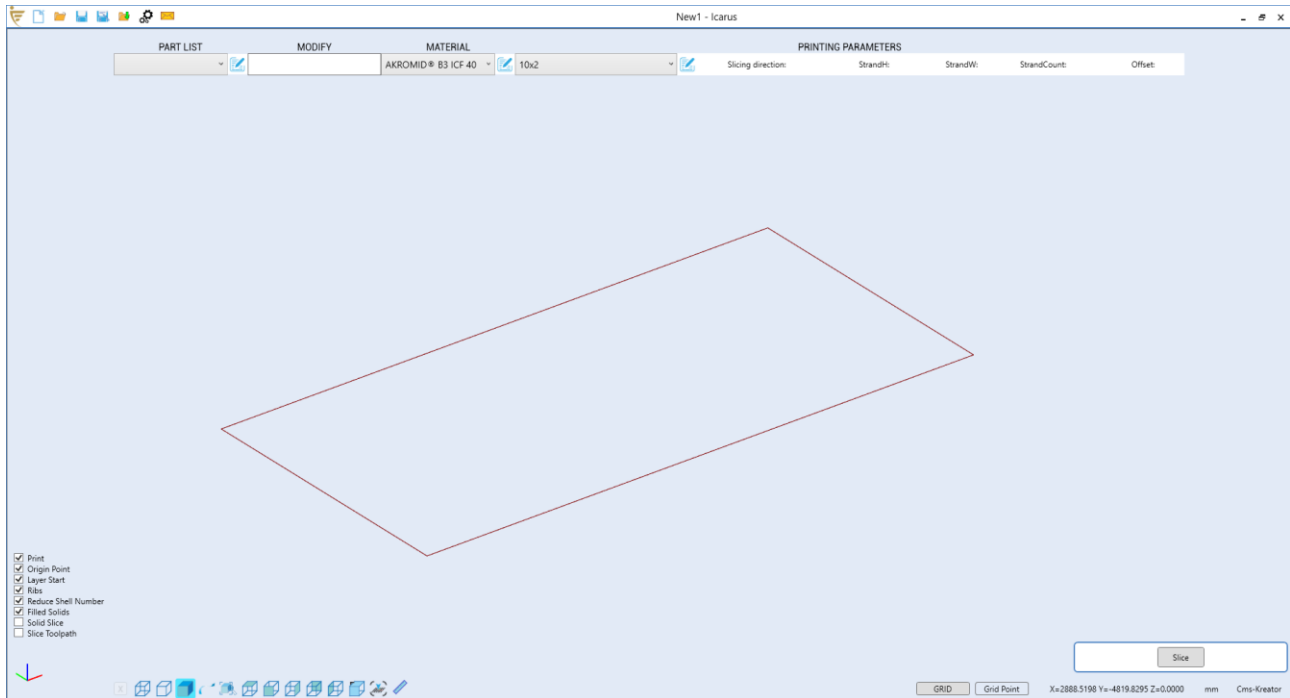
This document aims to provide a guide to the use of the ICARUS software developed by Egalware.

This software combined with a suitable machine for LFAM (Large Format Additive Manufacturing) is able to manage the 3D printing of complex parts, even of large dimensions.

In the following chapters the use of the ICARUS software will be described.

Introduction

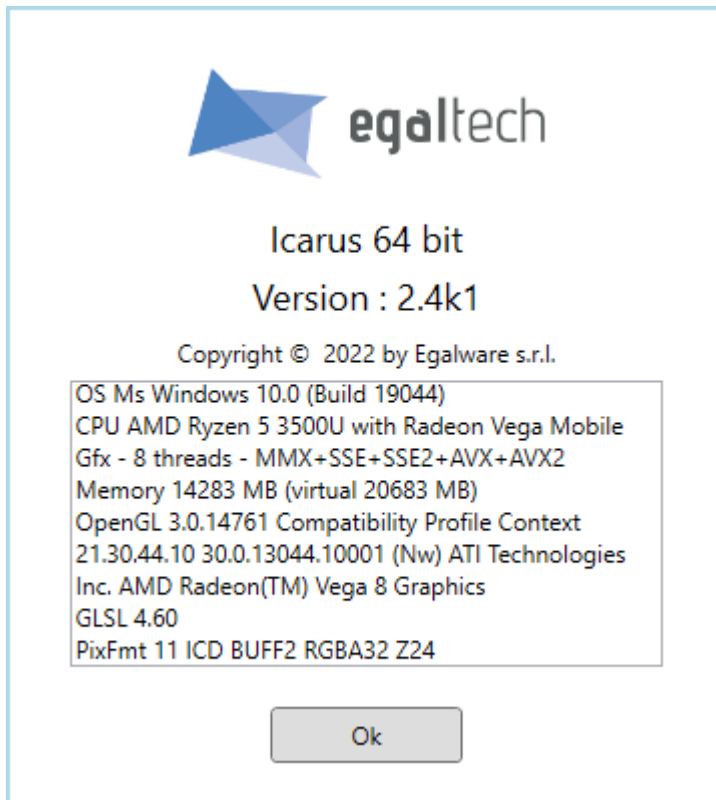
Icarus is the Slicing & Printing software made by Egalware for the Large Additive Manufacturing. In the picture below you can see the interface, which we will explain step by step in this documentation.



By clicking the upper left icon will appear a window containing all the software and system information. As showed in the below picture, it is used to check the installed version and the hardware build currently running the software.



If any support or assistance is needed, it is important to copy and transmit the information contained in the box so the technicians can have more information possible regarding the specific installation.



User Manual

Import of parts

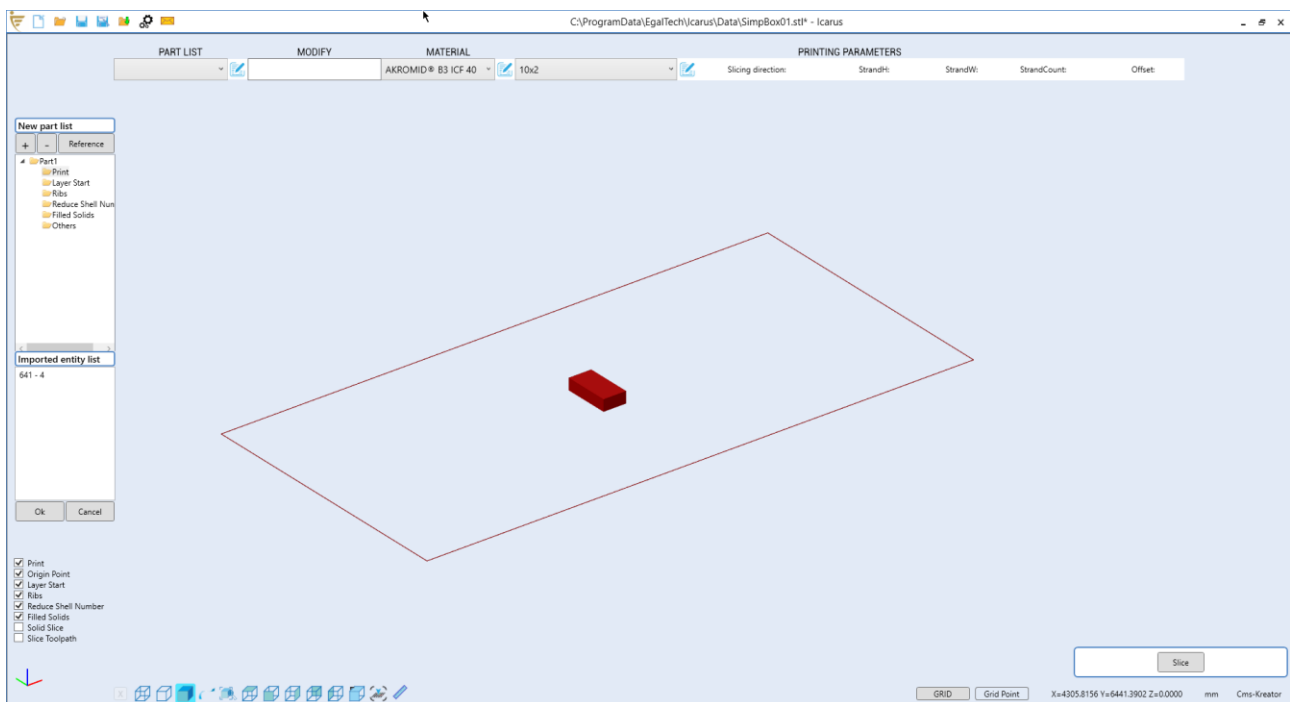
The utilization of Icarus starts with the procedure for importing a 3D model in order to generate the slices and the printing pattern. This is done by clicking the button "Import" in the upper left group as shown in the picture.



By clicking this button, a new window will open, allowing the user to select a 3d Model of the following formats:

- **STL** (Stereolithography)
- **IGS, IGES** (Iges File)
- **STP, STEP** (Step File)
- **3MF** (3D Manufacturing Format)
- **NGE** (New Geometry Egaltech)

In this documentation we will use a simple box with a rectangular base to demonstrate the functionalities offered by the software.



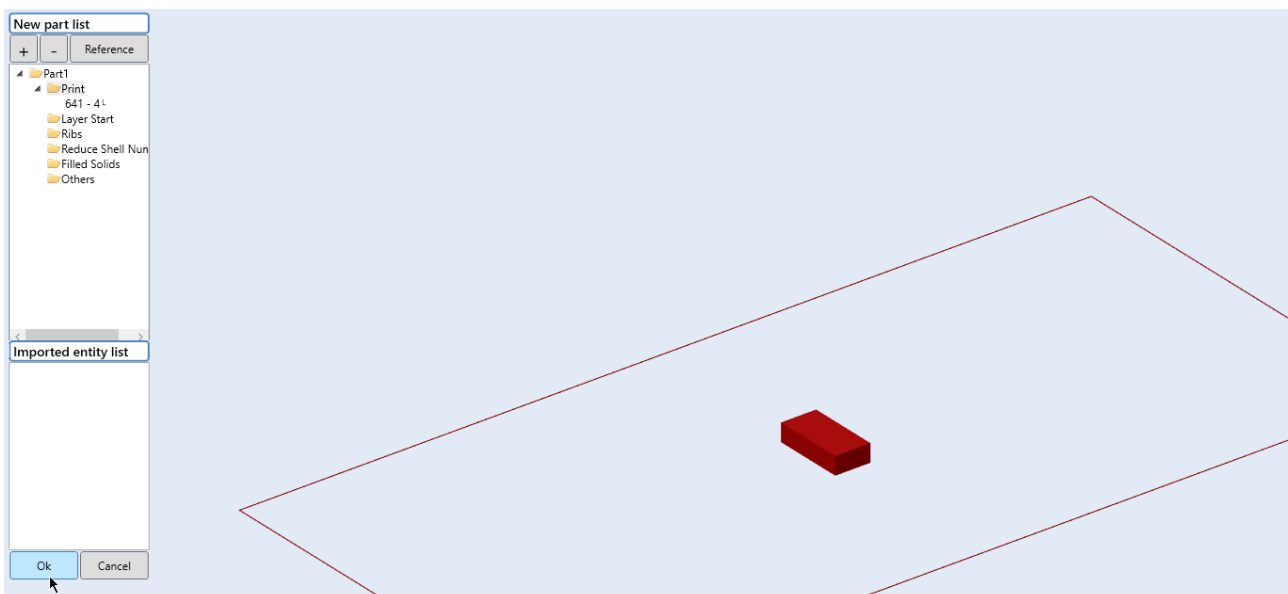
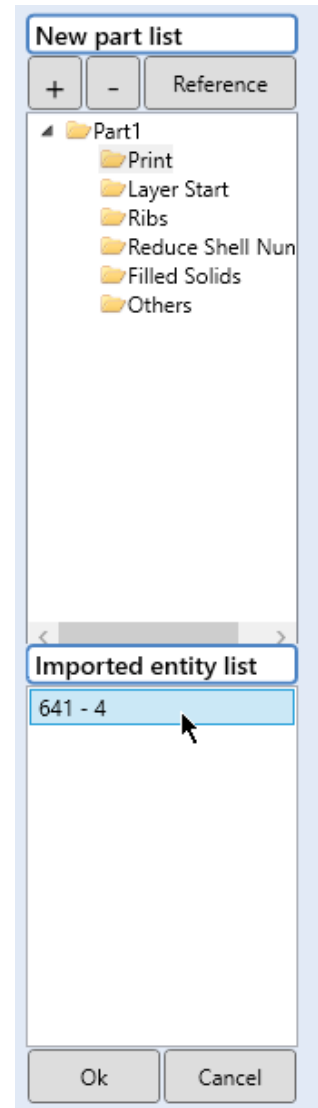
Once we have imported an entity, a new window will be displayed on the left, divided in two sections: the upper part shows the different entities that compose the project.

The lower part will display the newly imported entity, that need to be placed in the "Print" folder before doing any further operation.

In order to move the imported entity in the Print folder the user have to double click it in the Imported Entity List. After that, the entity is moved.

When the desired entity is under the Print folder the user must press "Ok" button to confirm the importation.

Now the entity is correctly imported and ready to be modified, and therefore to perform the Slicing when all the necessary modifications are done.



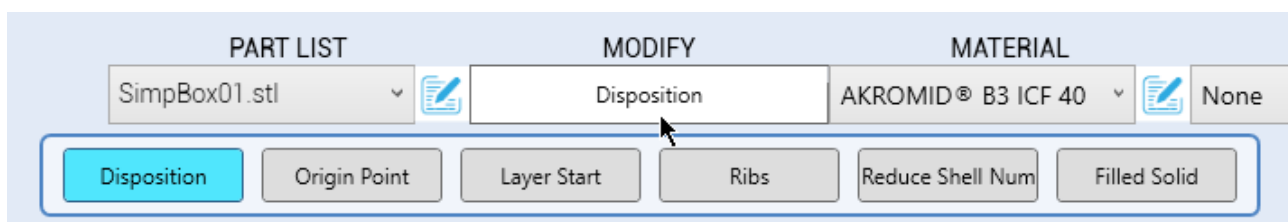
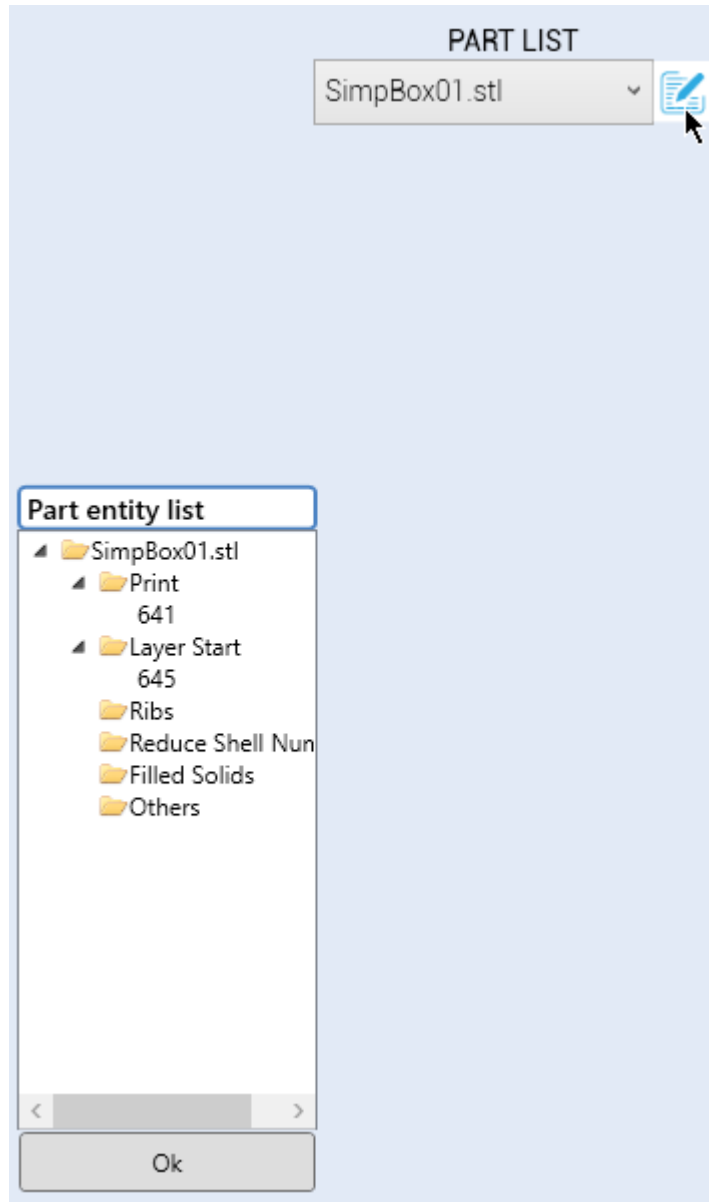
Modify Part

Now that we have imported the desired part and put it into the Print folder we can proceed with the necessary modification and parameter settings before launching the Slicing of the solid. In the upper part of the window there are the following boxes:

- **Part List**
- **Modify**
- **Material**

By clicking the white box under MODIFY there are various operations which will be displayed, as shown in the picture below:

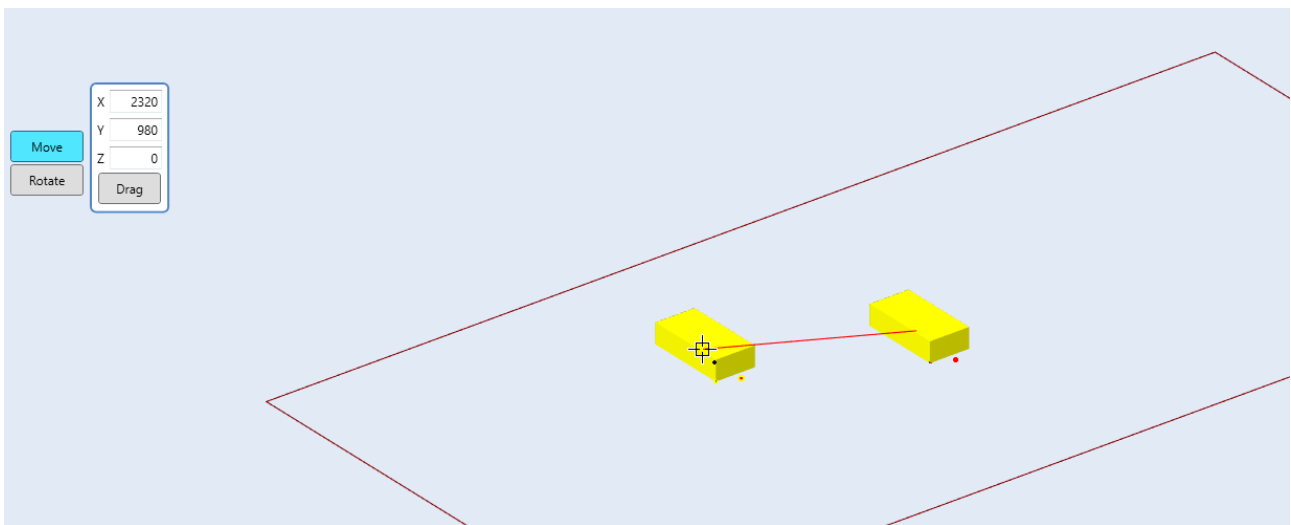
- **Disposition**
- **Origin Point**
- **Layer Start**
- **Ribs**
- **Reduce Shell Number**
- **Filled Solid**



Modify Disposition

The first option is used to move the solid on the machine table. Once selected "Disposition" under the Modify selection, two options will appear: Move and Rotate.

The operation of moving can be performed both by inserting the X Y Z parameters in the dedicated boxes and by grabbing and moving with the cursor the solid itself on the machine table (example in picture below).



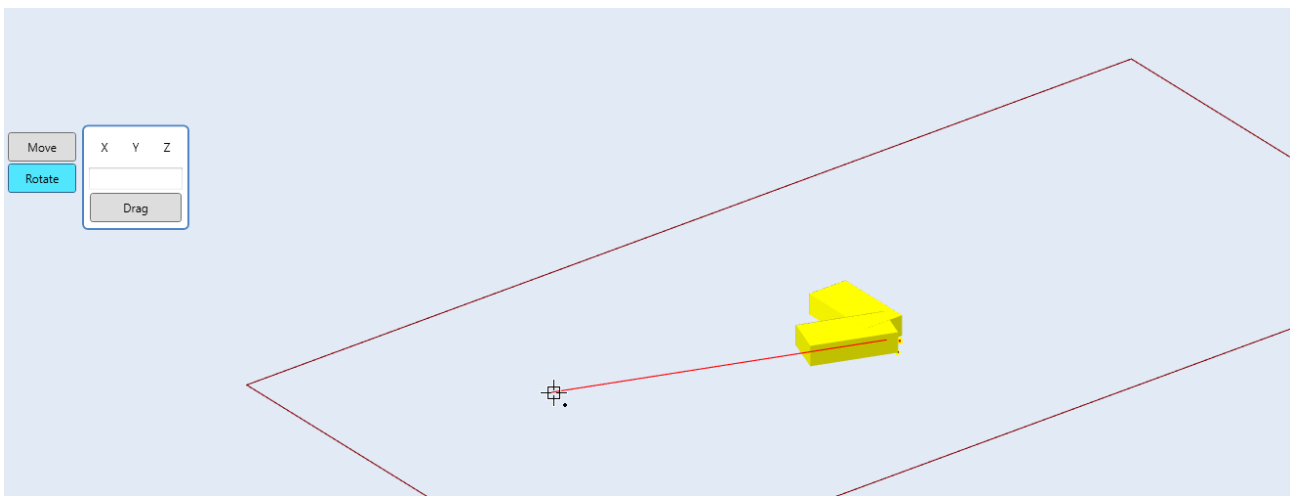
NOTE: when moving any entity by dragging, a box will appear in the lower section of the window: it will ask the user to insert a starting point and an ending point.

Those points can be selected manually by just clicking with the cursor the desired locations on the machine table, or can be written by the user in the dedicated box.

The next operation available when modifying the disposition of the entity on the machine table is the Rotation. When clicking the Rotate button, it will be possible to select the Drag option: then is necessary to insert, in this order, the following points:

- **Centre**
- **Base point**
- **Angle or Rotation point**

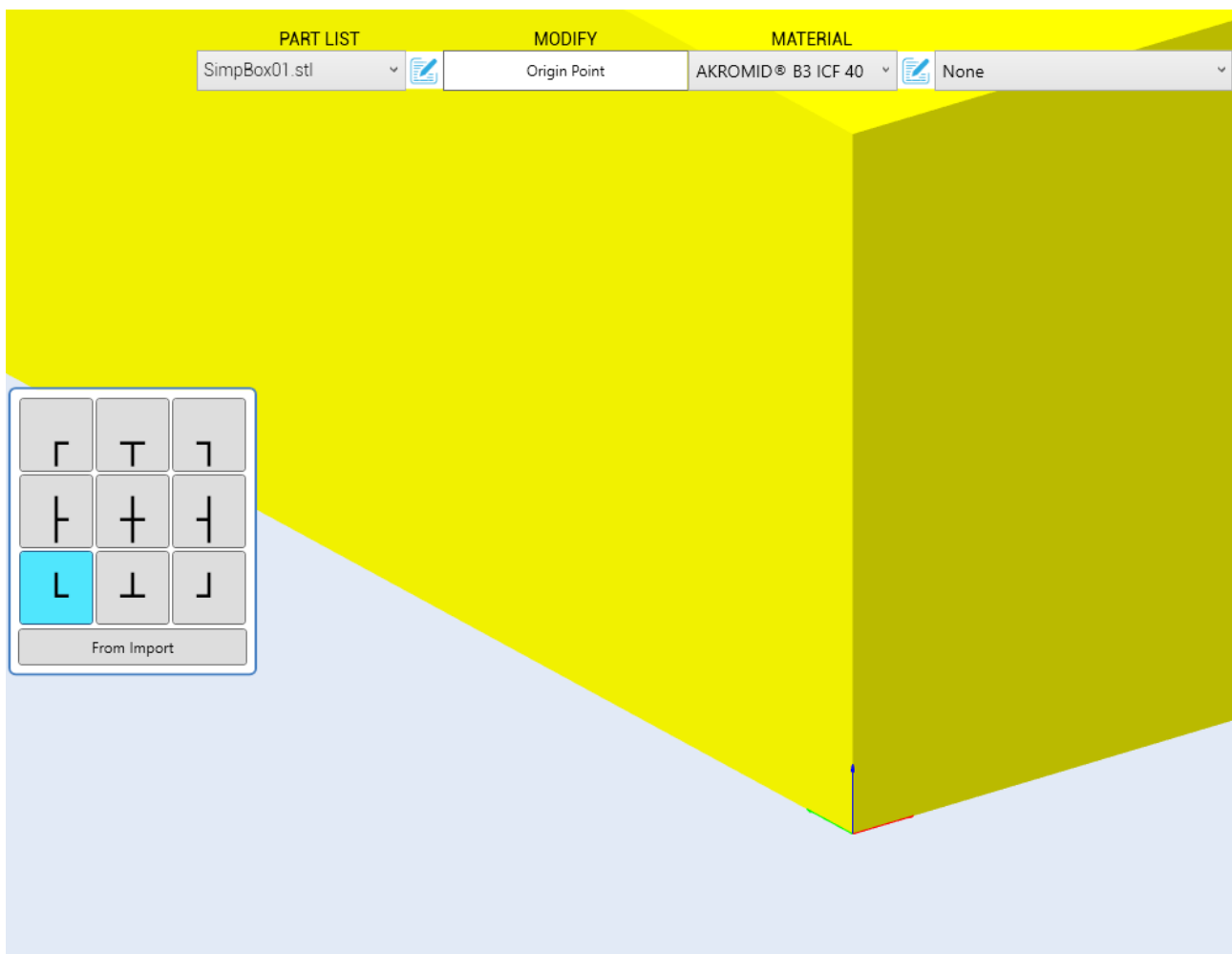
By doing this, the solid will rotate with the given parameters. The user can see the anticipation of the performed rotation before accepting it (see example below).



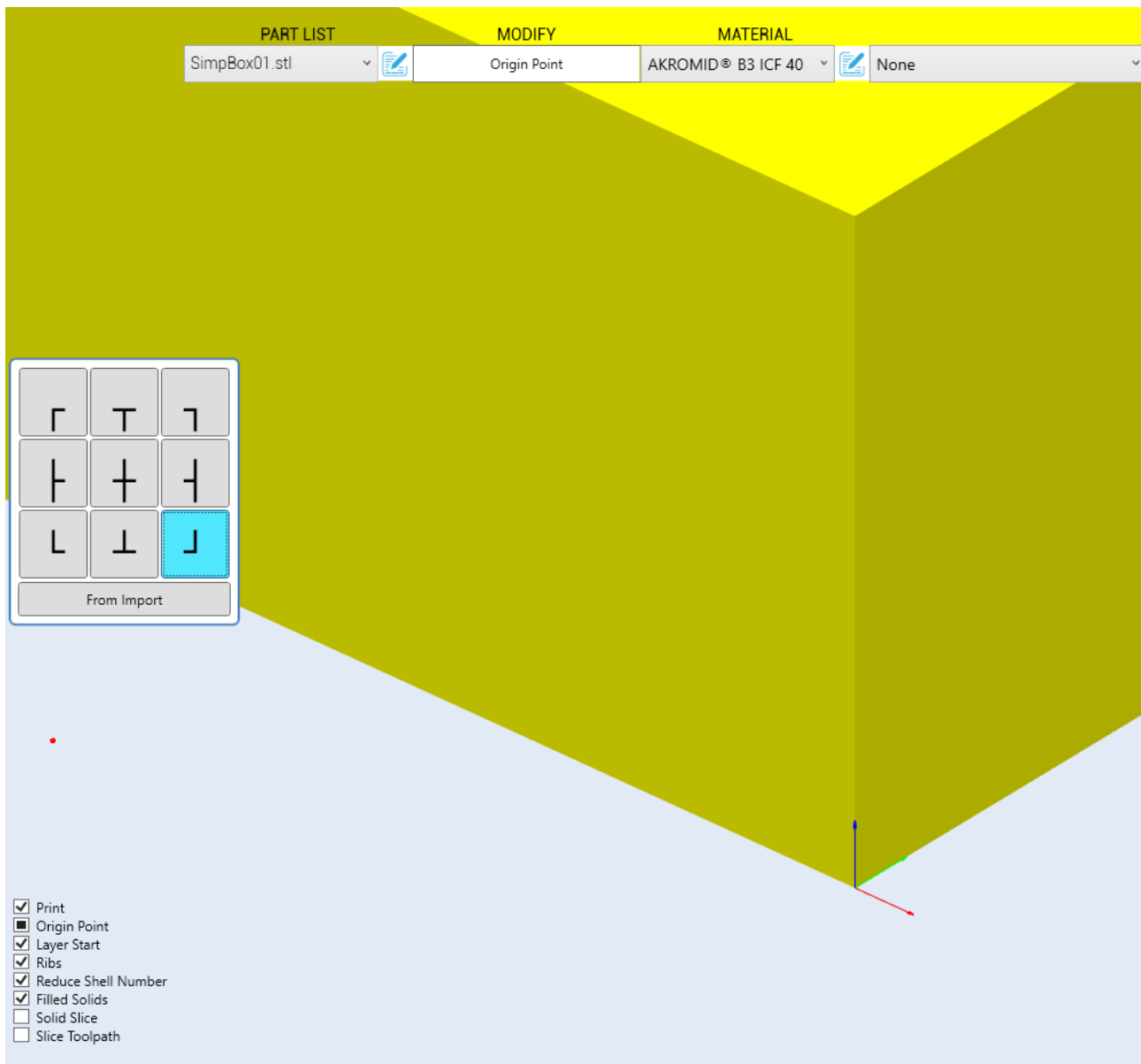
Modify Origin Point

The next option in the MODIFY section is Origin Point. This feature allows the user to switch the position of the Origin in different position.

By clicking it several boxes will appear on the left of the screen: those are graphical representation of the Axis Origin Position. By clicking one of those the origin will change accordingly.



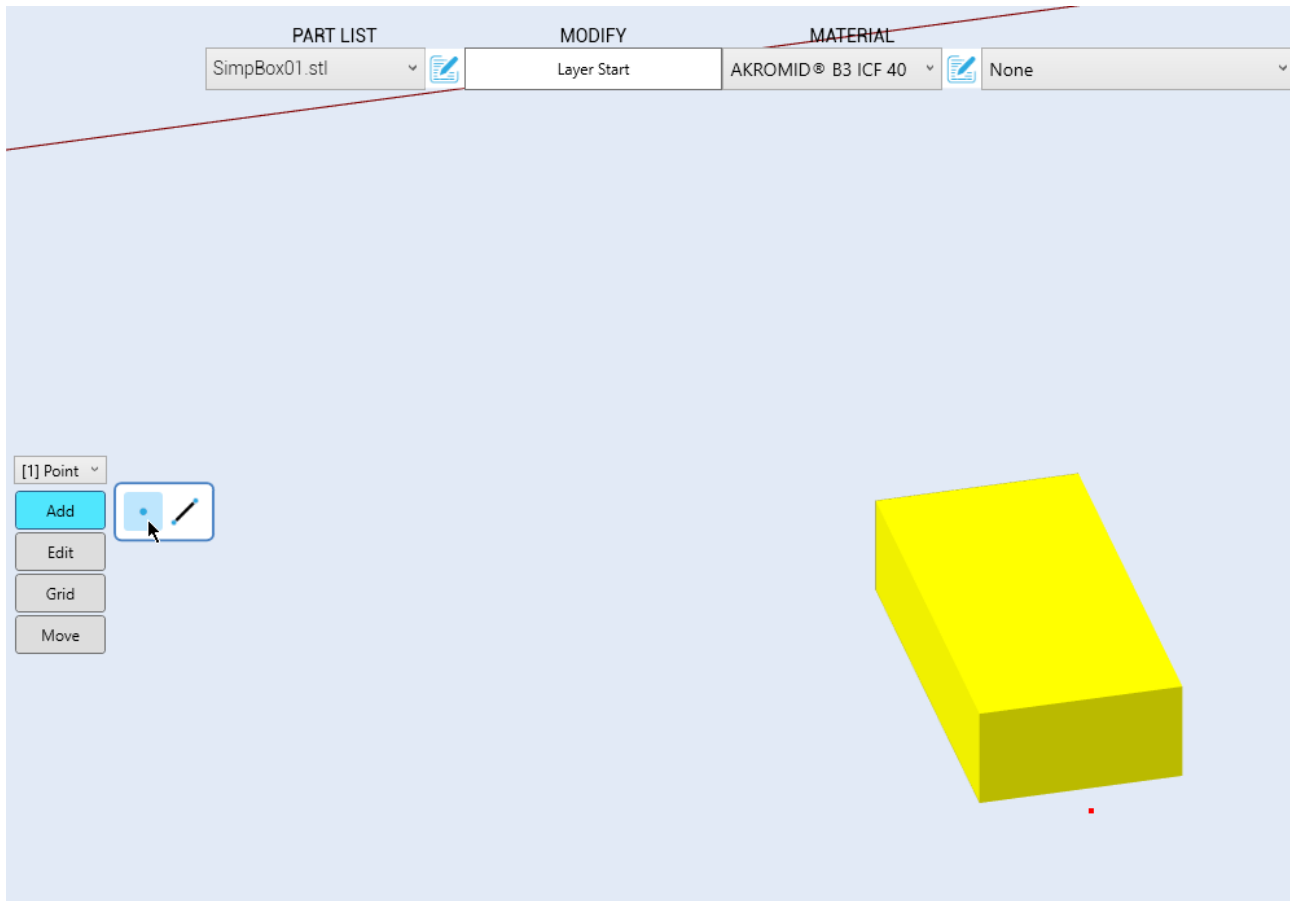
In this example we changed the Origin Point, it is possible to see the axis disposed in the desired way.



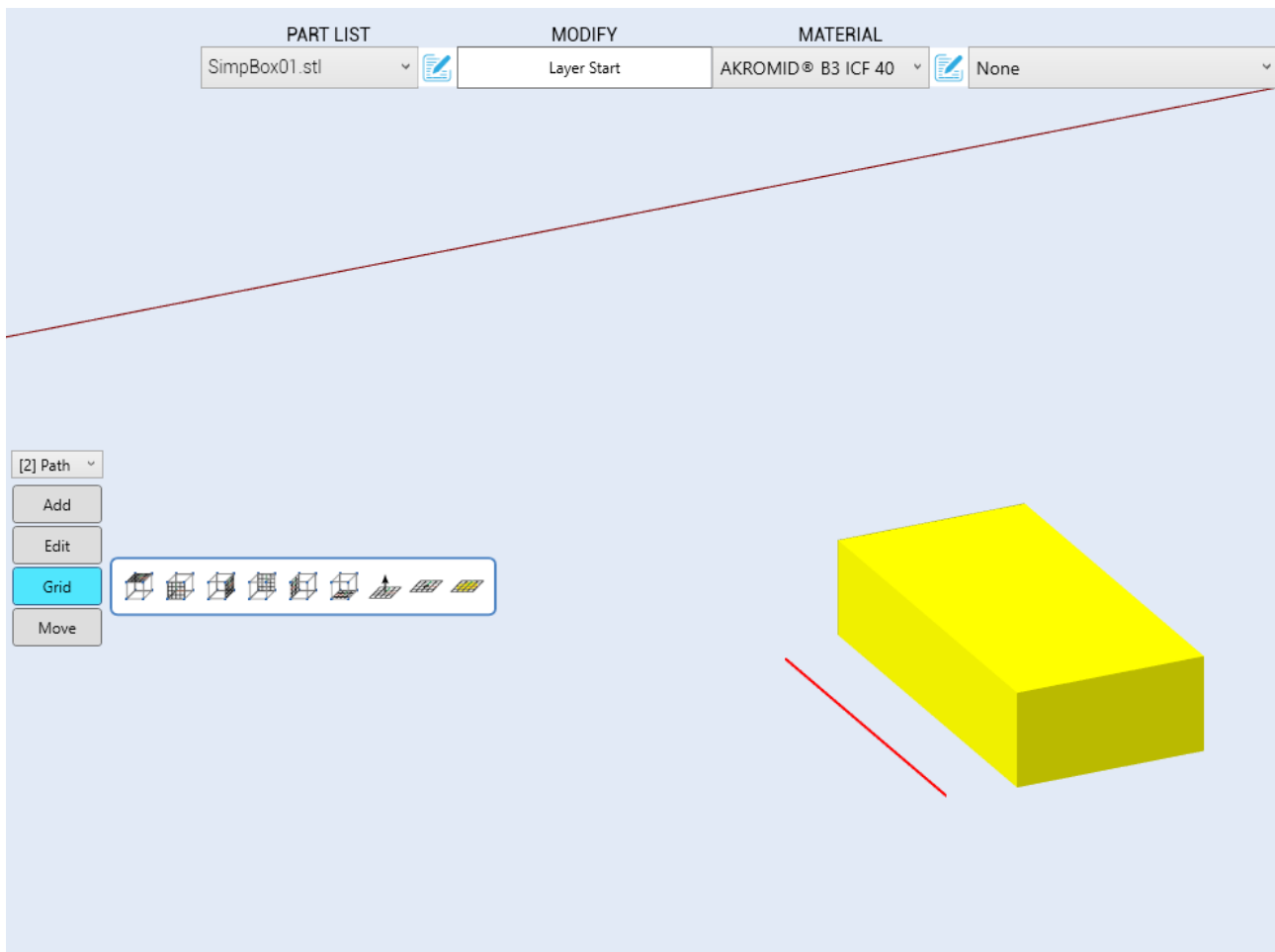
Modify Layer Start

The next option in the Modify group is Layer Start.

This is used for changing the starting position of each printed layer. It is possible to choose to set a point or a line for doing so. When drawing a point, the layer will start at the nearest point on the solid surface.



It is also possible to move and orient the Grid depending on the necessities when drawing the line or the point for the Layer Start.

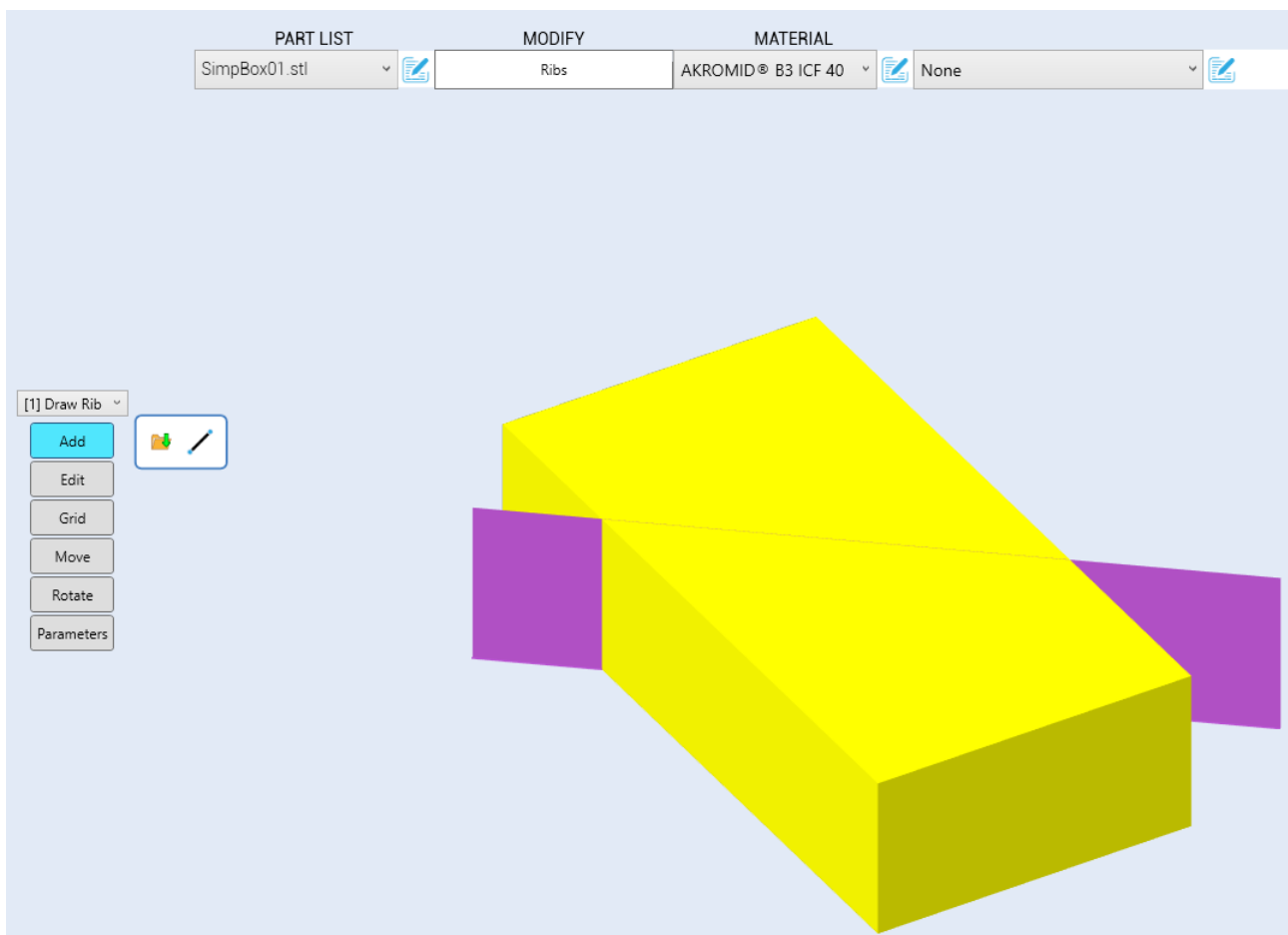


By clicking the Grid button, a list of options will be displayed, used to relocate the Grid on the various surfaces of the solid and to modify the Grid elevation.

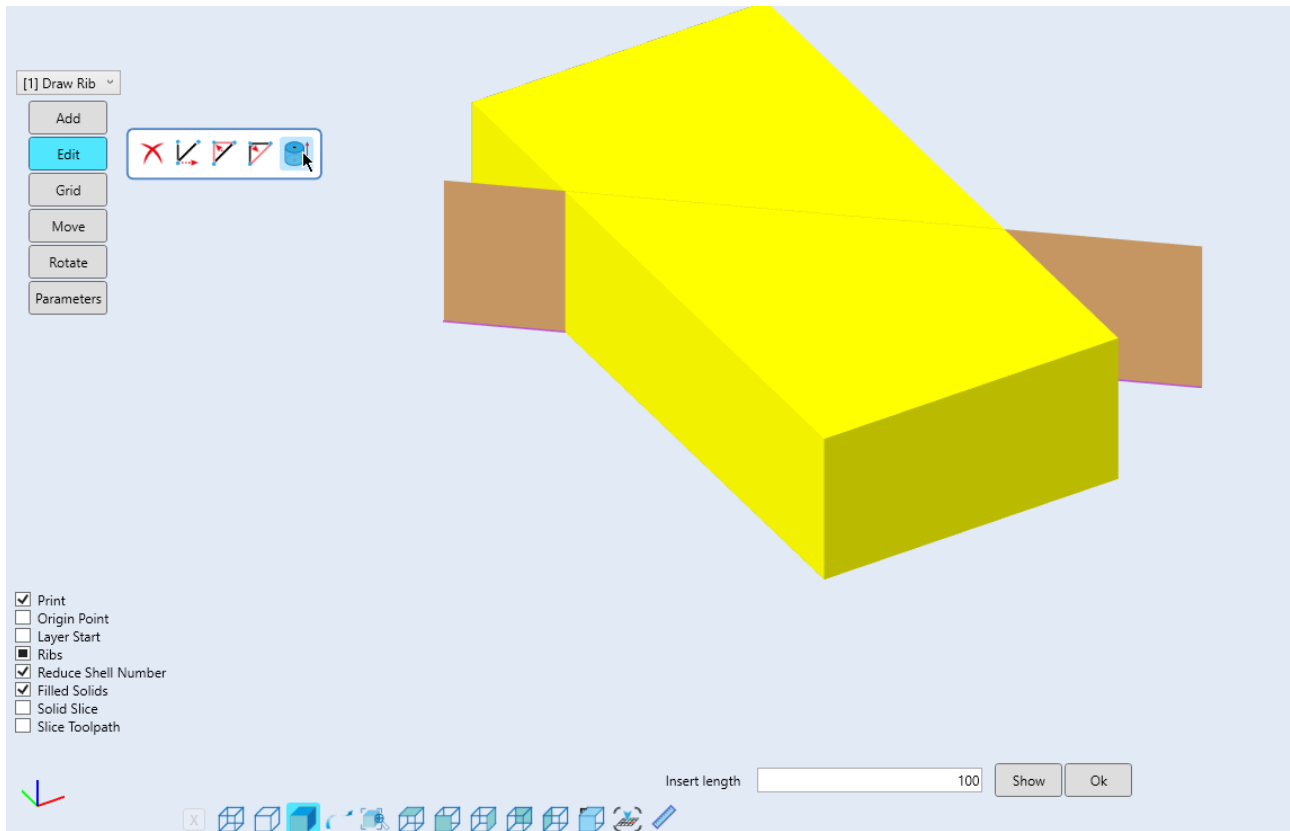
Modify Ribs

The command Modify Ribs is used to create or edit any Ribs in the solid to be printed. Ribs have usually a structural support function but they can be also used for other purposes.

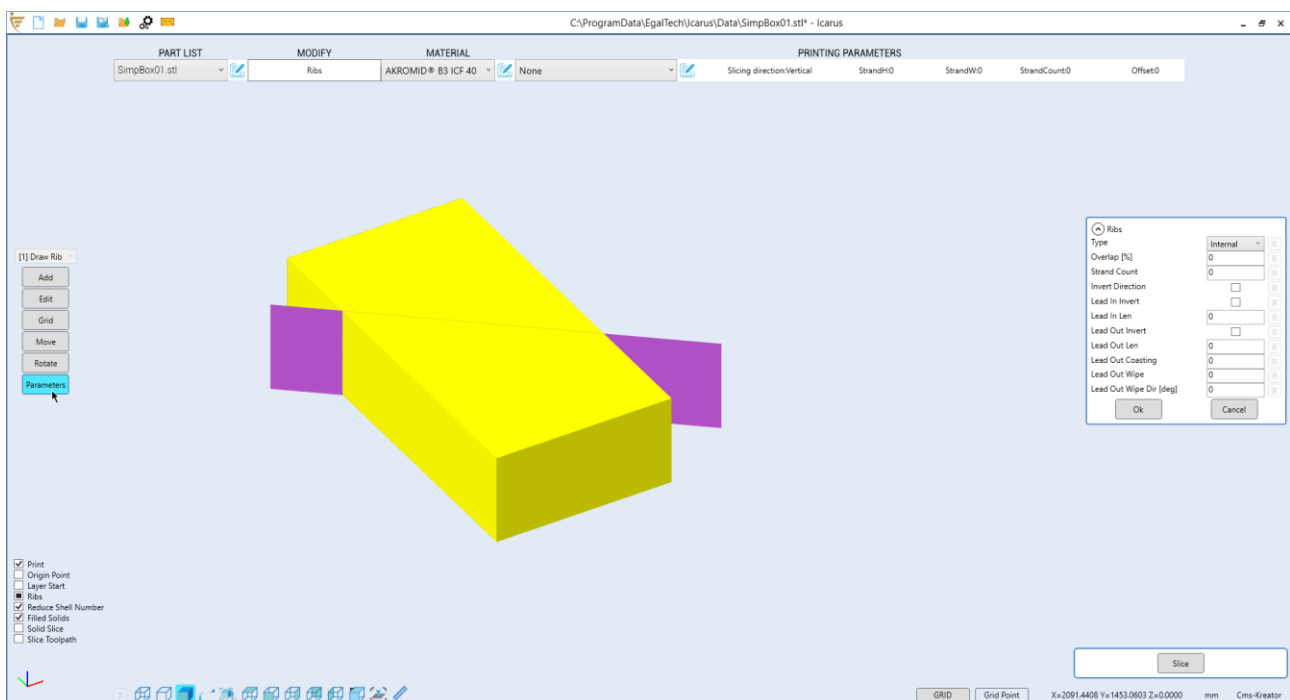
Ribs are usually imported with the project but they can also be drawn directly using Icarus. In the following examples we will show how to define a new Rib directly in Icarus environment.



When selecting "Modify Ribs" the first step to create a new one is by clicking "Add" and drawing a line. It may be necessary to alter an existing rib, this can be done by clicking "Edit".

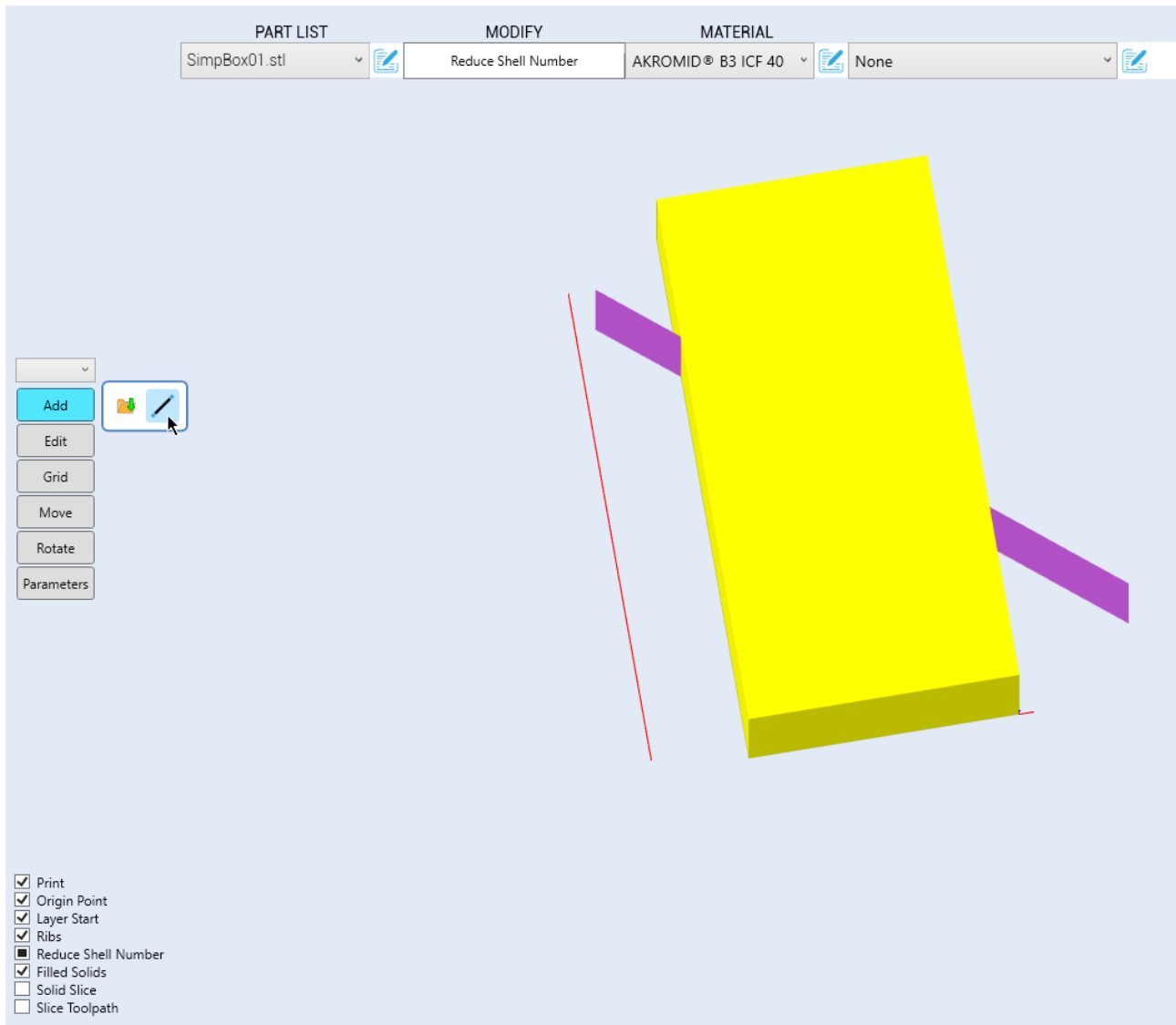


By clicking the "Parameters" button, at the bottom of the Modify Ribs group (on the left), a window will open on the right. This window's "Ribs" allows to modify the specific rib selected without modifying all the ribs settings.

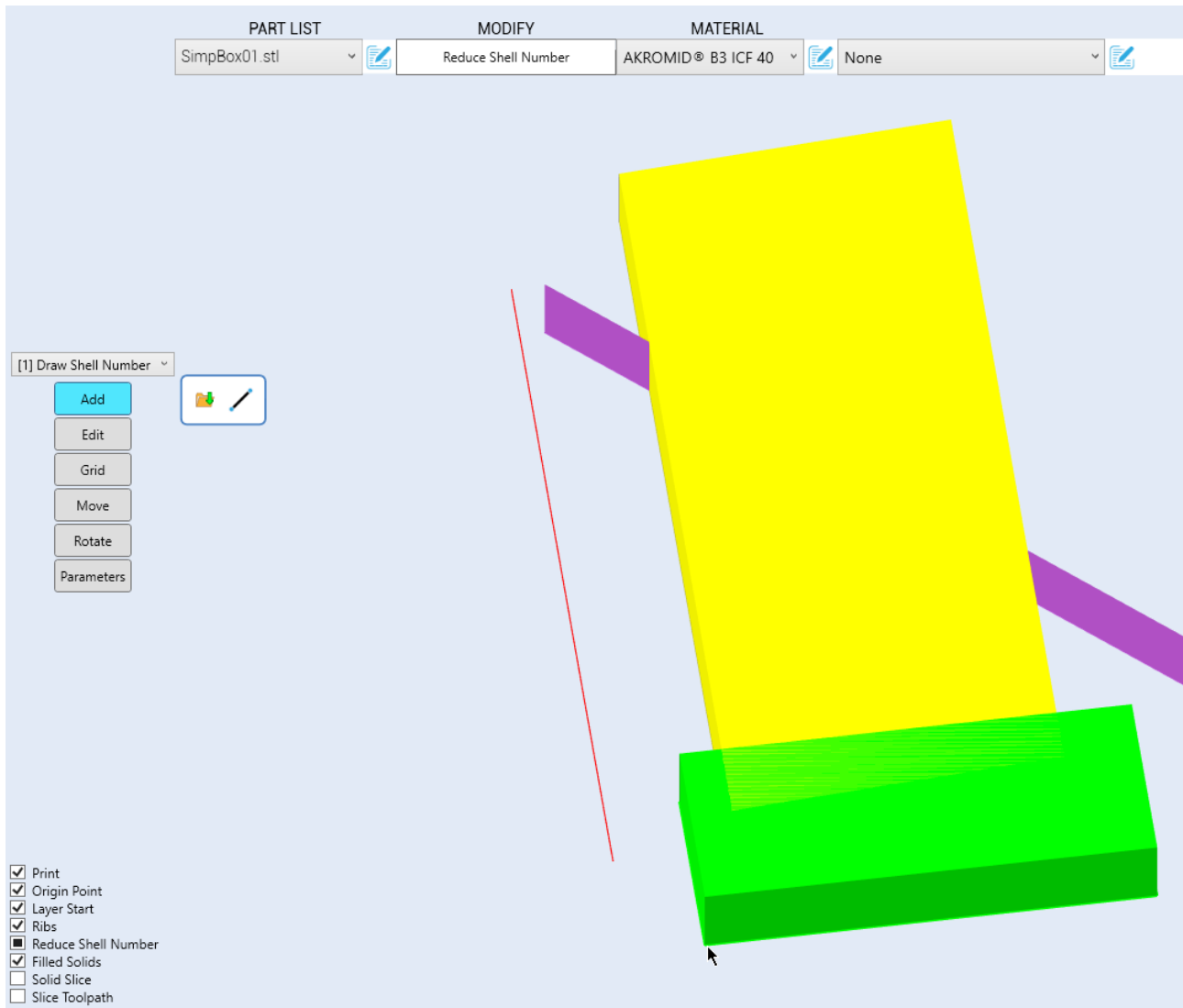


Reduce Shell Number

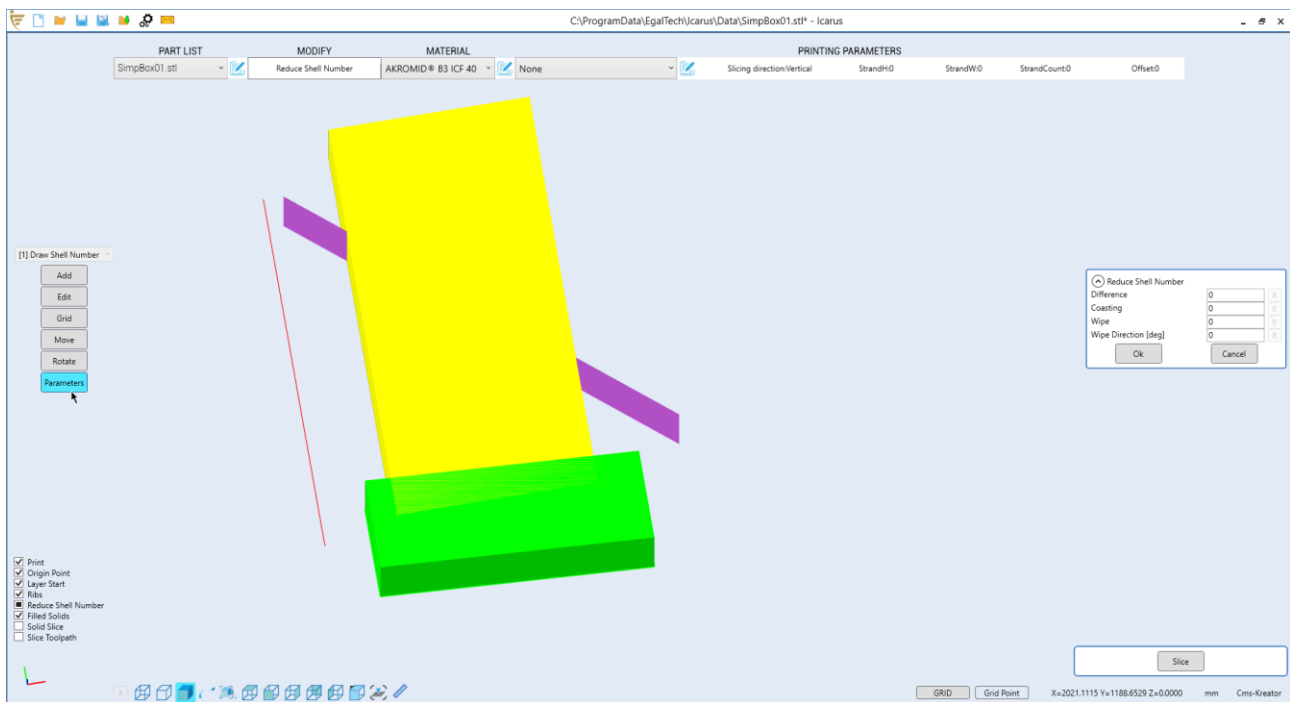
The function "Reduce Shell Number" is used to define an area in which the strand count is reduced by a precise amount. For example, when drawing a "reduce shell number" area on a side of the entity in which two strands are to be made, they can be reduced to only one strand.



For doing so it is necessary to draw a zone by clicking "Add" button and drawing lines to close the desired area. Then a coloured box will appear, showing the area of the reduced layers.

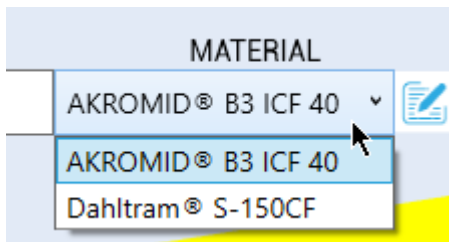


By clicking the "Parameters" button a window will open on the right of the screen, allowing the user to change the "Reduce Shell Number" settings only for this specific instance. The global parameters are instead modified by clicking the "Printing Parameters" button on the top right of the screen.

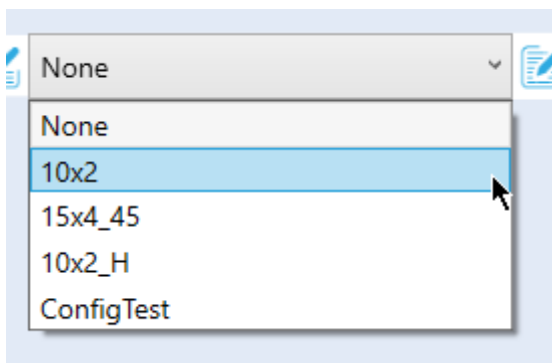


Materials

The selection "MATERIAL" allows the user to select the desired material used in the printing process. It is essential that the material selected is the correct one because different materials have different characteristics regarding the print time and the strand section.



After selecting the desired Material, it is possible to choose a pre-set of printing parameters. This is done by selecting a strand section (in the example, we have 10x2 or 15x4).



When is required to modify the printing parameters the user must click the "Edit" icon on the left of the strand section selector.

By doing so a window will appear on the right of the screen, containing all the sections of the parameters to be modified. In the next chapter of the documentation, we will explore in deep every one of those sections.

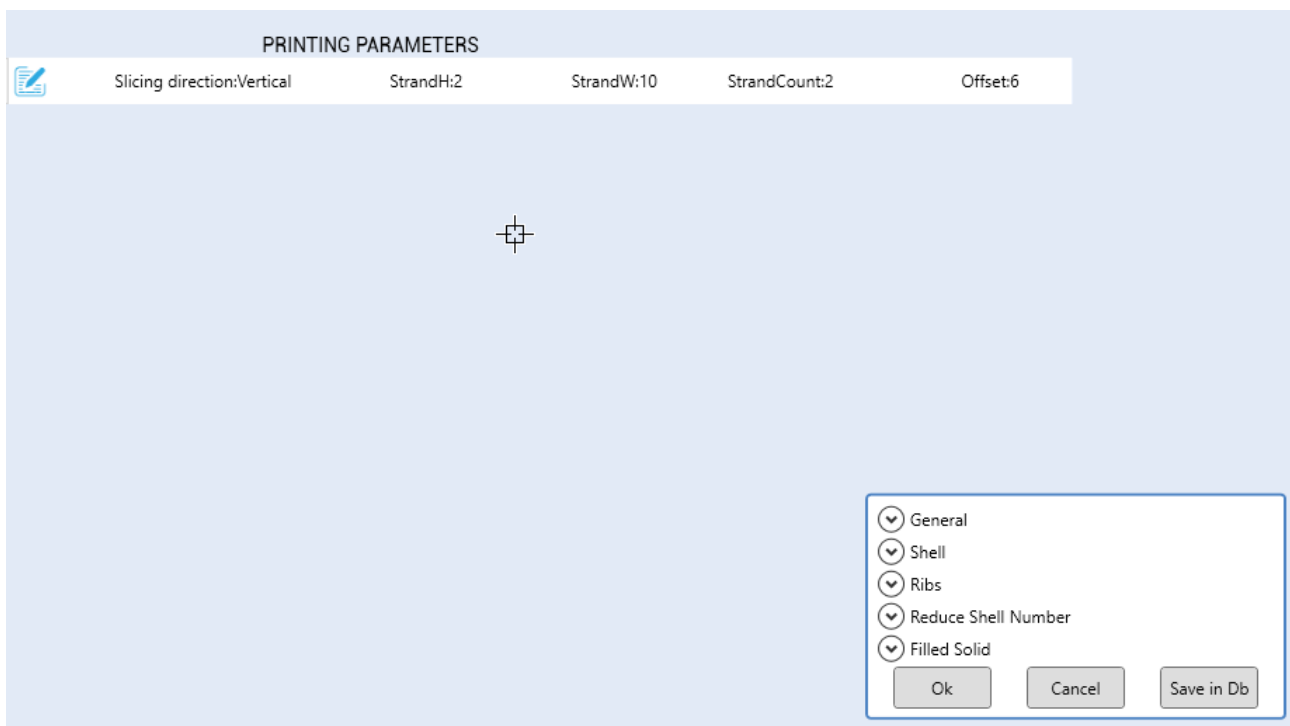
Print Parameters

In this section we will explain how to modify all the printing parameters and save a new set for utilization. The parameters can be edited after clicking on the resume box at the top of the windows.



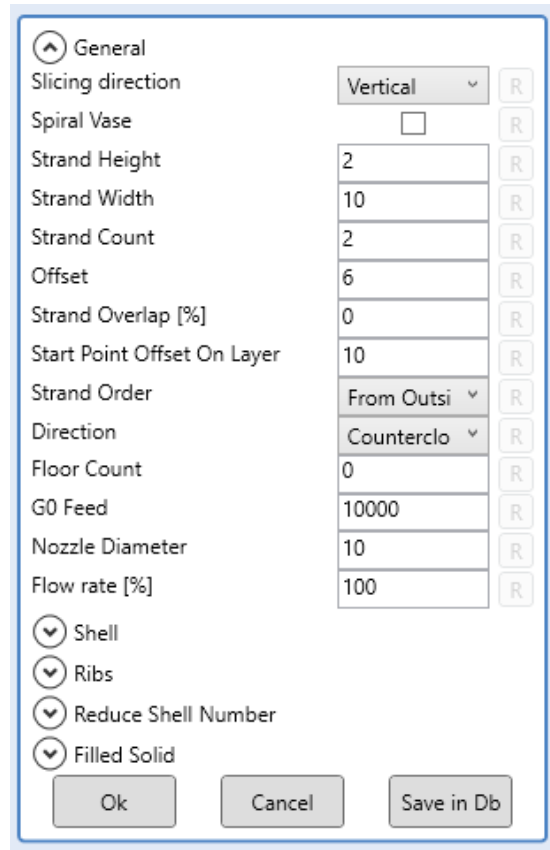
When clicking the top box, a window will show on the right. There are five groups of parameters that can be edited:

- General
- Shell
- Ribs
- Reduce Shell Number
- Filled Solid



General Parameters

- **Slicing Direction:** Can be Vertical, Horizontal or 45°. This affects the orientation of the extrusion.
- **Spiral Vase:** In this mode, the model's outline will be printed with one single shell for each layer and a continuous print, without stopping at the completion of each single slice.
- **Strand Height:** Set the height of the slice.
- **Strand Width:** Set the width of the slice.
- **Strand Count:** Set the number of shells to be printed.
- **Offset:** Distance from the original solid surface, extra material that will be removed.
- **Strand Overlap:** % of overlap between shells.
- **Start Point Offset on Layer:** Distance from the start of a shell and the start of the contiguous one.
- **Strand Order:** Set if the solid have to be print from outside to the inside or from the inside to the outside.
- **Direction:** Direction of the strand deposition (can be clockwise or counter clockwise).
- **Floor Count:** Number of filled layers at the base of the solid.
- **G0 Feed:** Feed used when the head is moving without extruding.
- **Nozzle Diameter:** Diameter expressed in millimetres of the nozzle.
- **Flow Rate:** This determines how much material is extruded when printing. The default amount is set to 100%.



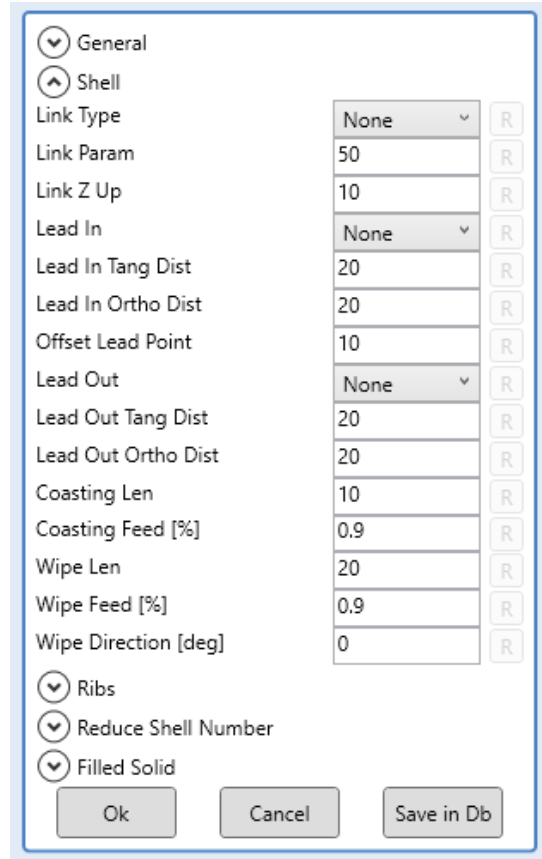
The screenshot shows the 'General' tab of a settings dialog box. It contains various parameters for 3D printing, each with a text input field and a 'Reset' button (marked with 'R').

Parameter	Value	Reset
Slicing direction	Vertical	R
Spiral Vase	<input type="checkbox"/>	R
Strand Height	2	R
Strand Width	10	R
Strand Count	2	R
Offset	6	R
Strand Overlap [%]	0	R
Start Point Offset On Layer	10	R
Strand Order	From Outsi	R
Direction	Counterclo	R
Floor Count	0	R
G0 Feed	10000	R
Nozzle Diameter	10	R
Flow rate [%]	100	R

Below the input fields, there are four expandable sections: 'Shell', 'Ribs', 'Reduce Shell Number', and 'Filled Solid'. At the bottom of the dialog are three buttons: 'Ok', 'Cancel', and 'Save in Db'.

Shell Parameters

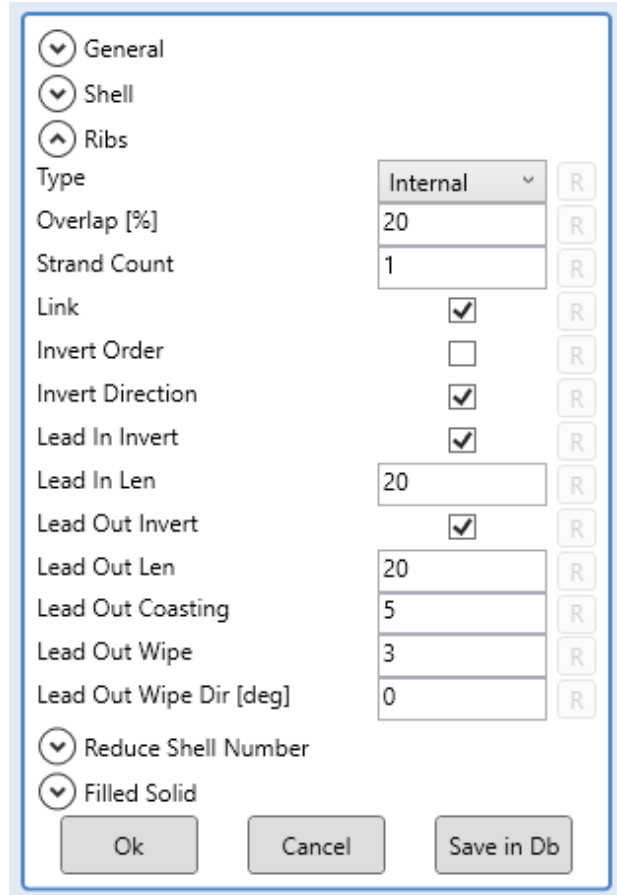
- **Link Type:** Set the type of the shell link; can be Linear, None or Biarc.
- **Link Param:** Length of the link between horizontal passes
- **Link Z Up:** Distance travelled in Z by the extruder when it goes in rapid movement, millimetres
- **Lead In:** Type of entrance of the strand in the solid. Can be None, Linear, Arc.
- **Lead In Tang Dist:** Distance on the tangent direction from starting layer point to the entrance point.
- **Lead In Ortho Dist:** Distance on the orthogonal direction from starting layer point to the entrance point.
- **Offset Lead Point:** Distance from the start point of a slice to the end point of the same slice in mm. Used to avoid material overlap
- **Lead Out:** Can be None: no lead towards the outside; Linear: linear exit; Arc: Arc exit.
- **Lead Out Tang Dist:** Distance on the tangent axis from the exit point to the end layer point.
- **Coasting Length:** Distance in millimetres before the end of the path where the nozzle is closed to stop the deposition of the material.
- **Coasting Feed:** Speed of advancement expressed in millimetres / minute for the execution of the Coasting Len section
- **Wipe Length:** Distance in millimetres of the extension of the passes with the nozzle closed to clean it of any excess material
- **Wipe Feed:** Feed speed expressed in% with respect to the value of the Feed parameter. 0.89 indicates 89% of the value of the Feed
- **Wipe Direction:** Direction expressed in degrees for the extruder during the wiping; for example, 0 is orthogonal to the direction of movement.



Parameter	Value	Unit/Type
Link Type	None	Dropdown
Link Param	50	Length
Link Z Up	10	Distance
Lead In	None	Dropdown
Lead In Tang Dist	20	Distance
Lead In Ortho Dist	20	Distance
Offset Lead Point	10	Distance
Lead Out	None	Dropdown
Lead Out Tang Dist	20	Distance
Lead Out Ortho Dist	20	Distance
Coasting Len	10	Distance
Coasting Feed [%]	0.9	Percentage
Wipe Len	20	Distance
Wipe Feed [%]	0.9	Percentage
Wipe Direction [deg]	0	Angle

Ribs Parameters

- **Type:** Can be Internal, External or Unbounded.
- **Overlap %:** Overlap of the Ribs shell with the internal shell of the solid
- **Strand Count:** Ribs thickness: number of passes to make
- **Link:** Check to link ribs, uncheck to not link ribs.
- **Invert Order:** Reverse the order of realization of the Ribs, or do not reverse the order of the Ribs.
- **Invert Direction:** Do not reverse the direction of the passes for the Ribs or reverse the direction of the passes for the Ribs.
- **Lead In Invert:** Do not invert the entry angle of the pass for the realization of the Ribs or Reverse the entry angle of the pass for the realization of the Ribs.
- **Lead Out Invert:** Do not invert the exit angle of the pass for the realization of the Ribs or Reverse the entry angle of the pass for the realization of the Ribs.
- **Lead Out Length:** Offset distance in millimetres between the end point of the pass and the end of the material deposition
- **Lead Out Coasting:** Distance in millimetres between the material deposition end point and the movement end point continuing in tangency
- **Lead Out Wipe:** Distance in millimetres between the end of movement point expressed in the previous parameter and the extruder outlet
- **Lead Out Wipe Dir:** Extruder exit angle expressed in degrees; for example, 0 is orthogonal to the direction of movement.



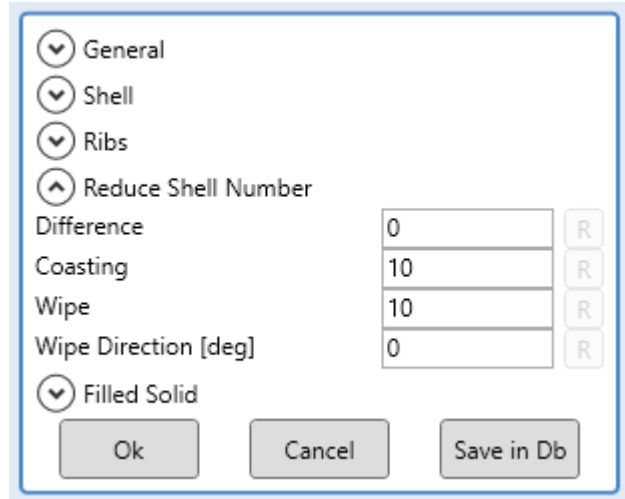
The screenshot shows the 'Ribs Parameters' dialog box with the 'Ribs' tab selected. The parameters are as follows:

Parameter	Value	Reset (R)
Type	Internal	<input type="button" value="R"/>
Overlap [%]	20	<input type="button" value="R"/>
Strand Count	1	<input type="button" value="R"/>
Link	<input checked="" type="checkbox"/>	<input type="button" value="R"/>
Invert Order	<input type="checkbox"/>	<input type="button" value="R"/>
Invert Direction	<input checked="" type="checkbox"/>	<input type="button" value="R"/>
Lead In Invert	<input checked="" type="checkbox"/>	<input type="button" value="R"/>
Lead In Len	20	<input type="button" value="R"/>
Lead Out Invert	<input checked="" type="checkbox"/>	<input type="button" value="R"/>
Lead Out Len	20	<input type="button" value="R"/>
Lead Out Coasting	5	<input type="button" value="R"/>
Lead Out Wipe	3	<input type="button" value="R"/>
Lead Out Wipe Dir [deg]	0	<input type="button" value="R"/>

At the bottom, there are three buttons: 'Ok', 'Cancel', and 'Save in Db'. Above these buttons are two collapsed sections: 'Reduce Shell Number' and 'Filled Solid'.

Reduce Shell Number Parameters

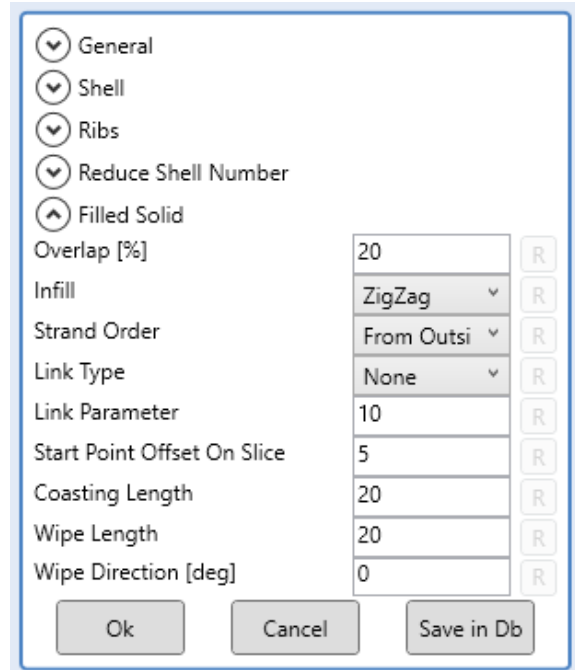
- **Difference:** Number of shells to be reduced while applying this function.
- **Coasting:** Distance in millimetres before the closing of the nozzle to stop the deposition of the material before the end of the path
- **Wipe:** Distance in millimetres of the extension of the passes with the nozzle closed to clean it of any excess material
- **Wipe Direction:** Direction expressed in degrees for the extruder during the wiping; for example, 0 is orthogonal to the direction of movement.



Parameter	Value	Action
Difference	0	R
Coasting	10	R
Wipe	10	R
Wipe Direction [deg]	0	R

Filled Solid Parameters

- **Overlap:** % of overlapping of the Filled Solid.
- **Infill:** Pattern to be performed while doing the infill.
- **Strand Order:** Specify if the order to be performed is from outside to inside or from inside to outside.
- **Link Type:** Can be None, Linear or biarc
- **Link Parameter:** Length of the link between horizontal passes
- **Start Point Offset on Slice:** Offset in millimetres between a slice start and the upper one
- **Coasting Length:** Distance in millimetres before the closing of the nozzle to stop the deposition of the material before the end of the path
- **Wipe Length:** Distance in millimetres of the extension of the passes with the nozzle closed to clean it of any excess material
- **Wipe Direction:** Direction expressed in degrees for the extruder during the wiping.



The screenshot shows a software dialog box titled 'Filled Solid Parameters'. It features a list of tabs on the left: General, Shell, Ribs, Reduce Shell Number, and Filled Solid (which is currently selected). The main area contains several parameters, each with a text input field and a small 'R' button to its right:

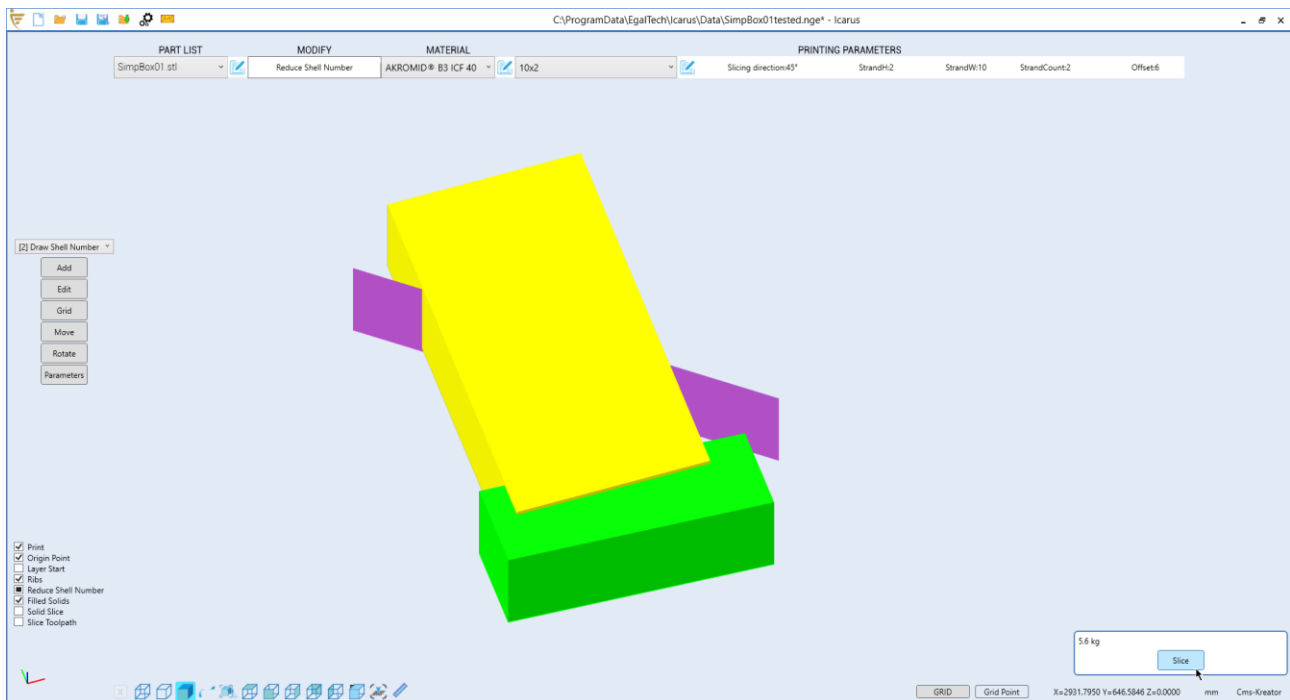
Parameter	Value	Action
Overlap [%]	20	R
Infill	ZigZag	R
Strand Order	From Outsi	R
Link Type	None	R
Link Parameter	10	R
Start Point Offset On Slice	5	R
Coasting Length	20	R
Wipe Length	20	R
Wipe Direction [deg]	0	R

At the bottom of the dialog are three buttons: 'Ok', 'Cancel', and 'Save in Db'.

Slicing

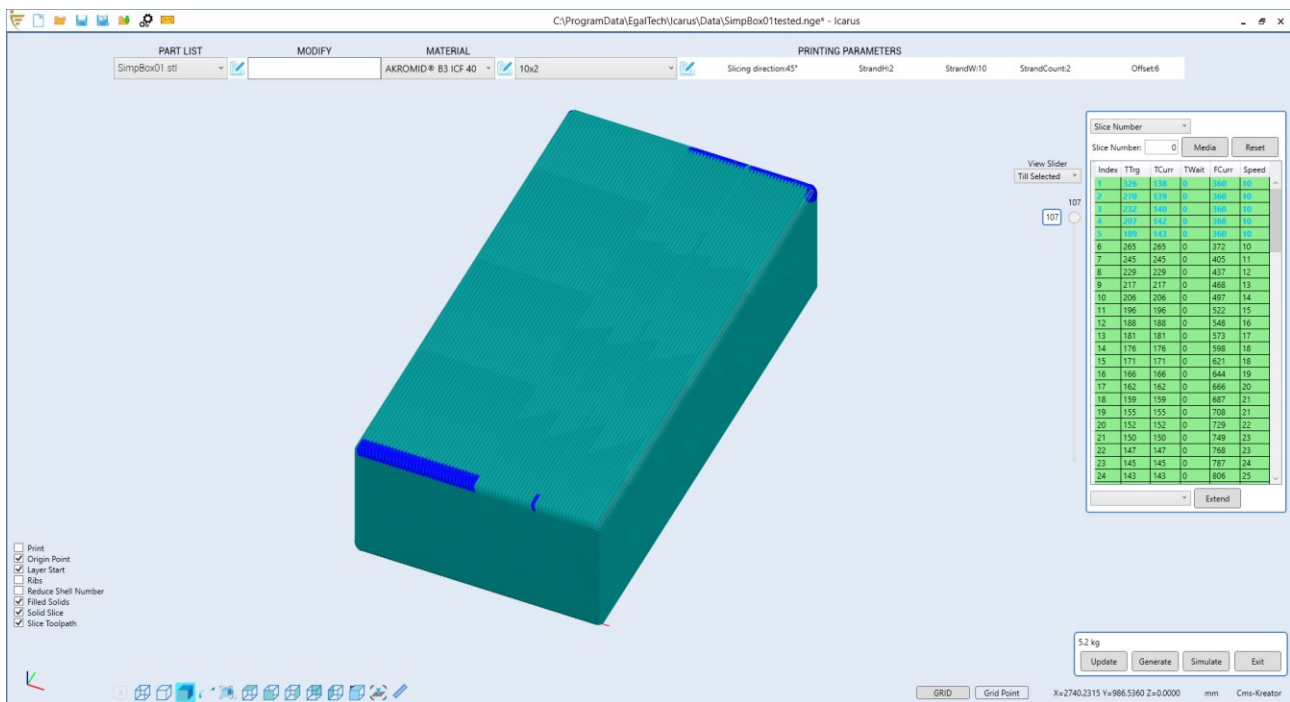
Once all the parameters are set and the eventual Ribs and Reduce Shell Number are placed it is possible to launch the Slicing of the entity to be printed.

In order to do so it is necessary to click the "Slice" button on the bottom right of the window as shown in the example below.

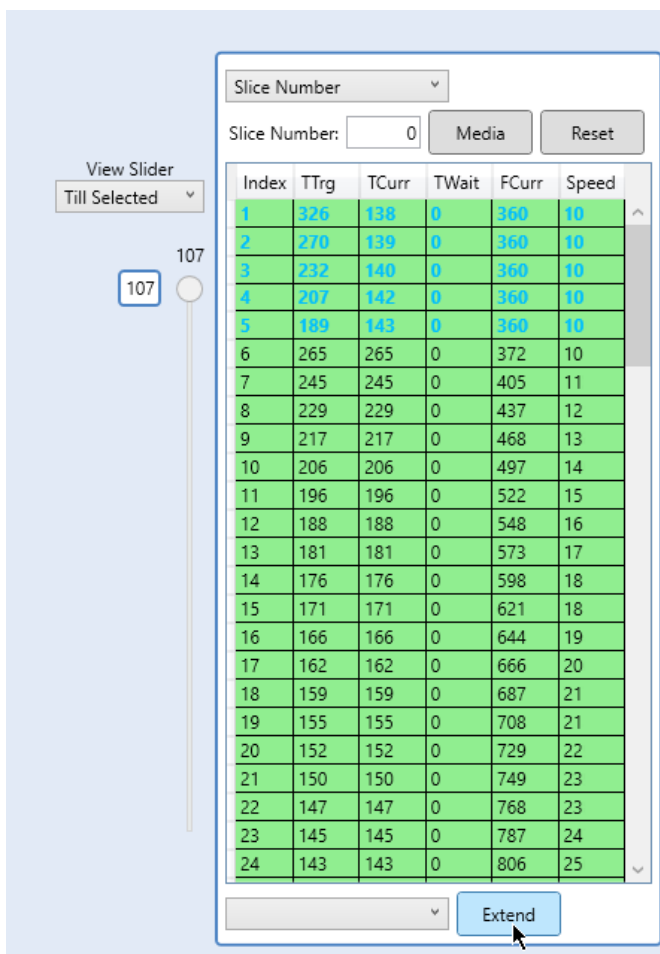


After the slicing is completed, it is possible to see the strands generated using the currently selected parameters.

In order to view this, it's necessary to check the "Solid Slice" box in the bottom left of the screen.



In the right it is displayed a table containing information regarding every slice. By clicking the button "Extend" this table will be fully displayed.



The lines represent every slice necessary to print the solid

The columns present in this table contain the following information:

- **Index (number of slice)**
- **Length**
- **Time Min**
- **Time Target**
- **Time Max**
- **Time Current**
- **Time Wait**
- **Feed Min**
- **Feed Target**
- **Feed Max**
- **Feed Current**
- **Speed**

View Slider

Till Selected ▼

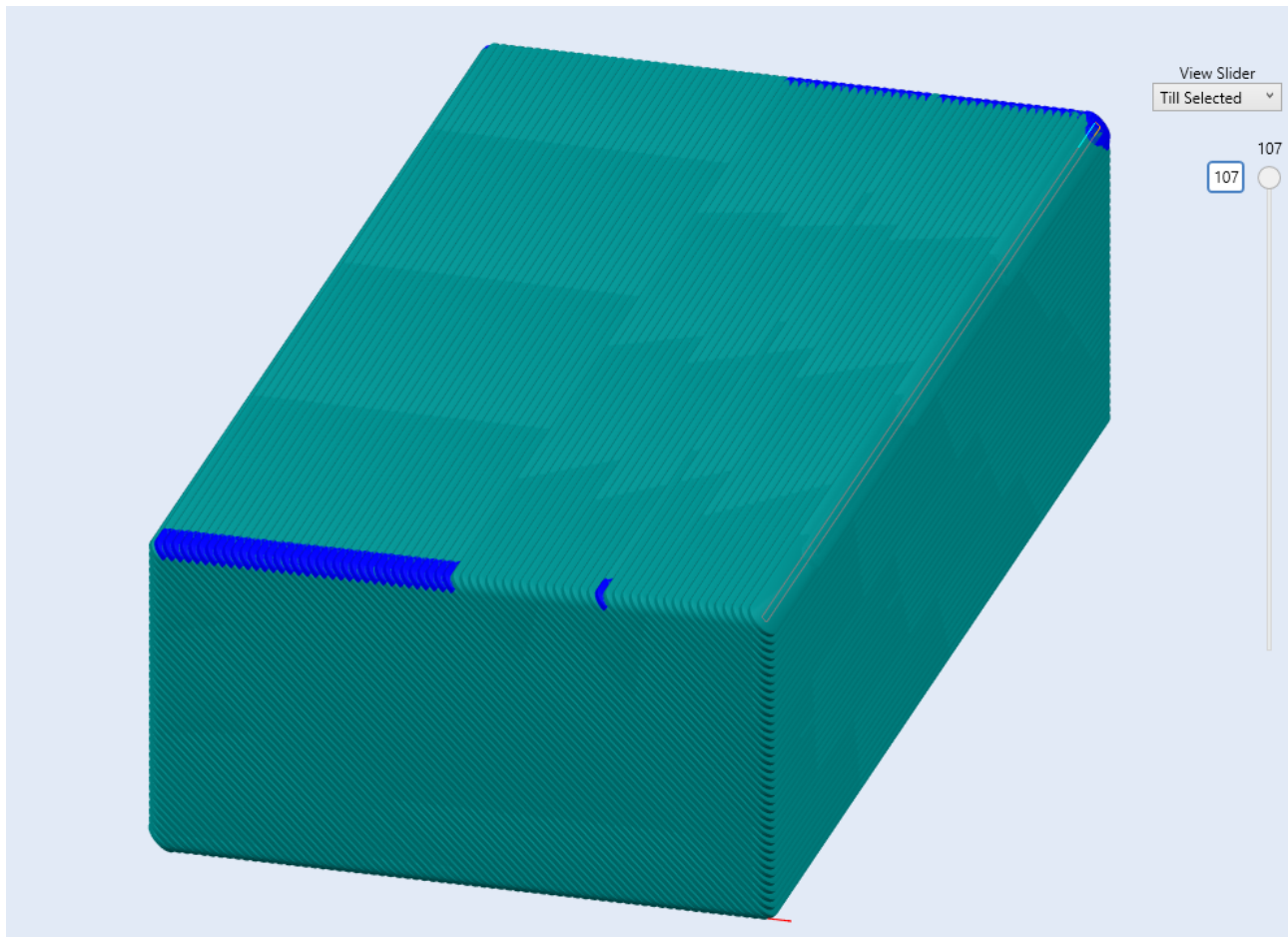
107

Index	Length	TMin	TTrg	TMax	TCurr	TWait	FMin	FTrg	FMax	FCurr	Speed
1	827	129	326	427	138	0	116	152	385	360	10
2	834	112	270	353	139	0	142	185	447	360	10
3	842	100	232	303	140	0	167	218	503	360	10
4	850	93	207	270	142	0	189	247	550	360	10
5	858	87	189	246	143	0	209	273	589	360	10
6	1639	110	265	346	265	0	284	372	891	372	10
7	1656	104	245	320	245	0	310	405	951	405	11
8	1672	100	229	300	229	0	335	437	1006	437	12
9	1689	96	217	283	217	0	358	468	1057	468	13
10	1706	93	206	269	206	0	381	497	1105	497	14
11	1700	89	196	255	196	0	400	522	1140	522	15
12	1716	87	188	245	188	0	420	548	1182	548	16
13	1733	85	181	236	181	0	440	573	1221	573	17
14	1750	83	176	229	176	0	459	598	1258	598	18
15	1767	82	171	222	171	0	477	621	1294	621	18
16	1784	81	166	216	166	0	495	644	1328	644	19
17	1800	79	162	211	162	0	512	666	1361	666	20
18	1817	78	159	206	159	0	529	687	1393	687	21
19	1834	77	155	202	155	0	545	708	1424	708	21
20	1851	76	152	198	152	0	561	729	1453	729	22
21	1867	76	150	194	150	0	576	749	1482	749	23
22	1884	75	147	191	147	0	591	768	1511	768	23
23	1901	74	145	188	145	0	606	787	1538	787	24
24	1918	74	143	185	143	0	621	806	1565	806	25
25	1935	73	141	183	141	0	635	824	1592	824	25
26	1951	72	139	180	139	0	649	842	1618	842	26

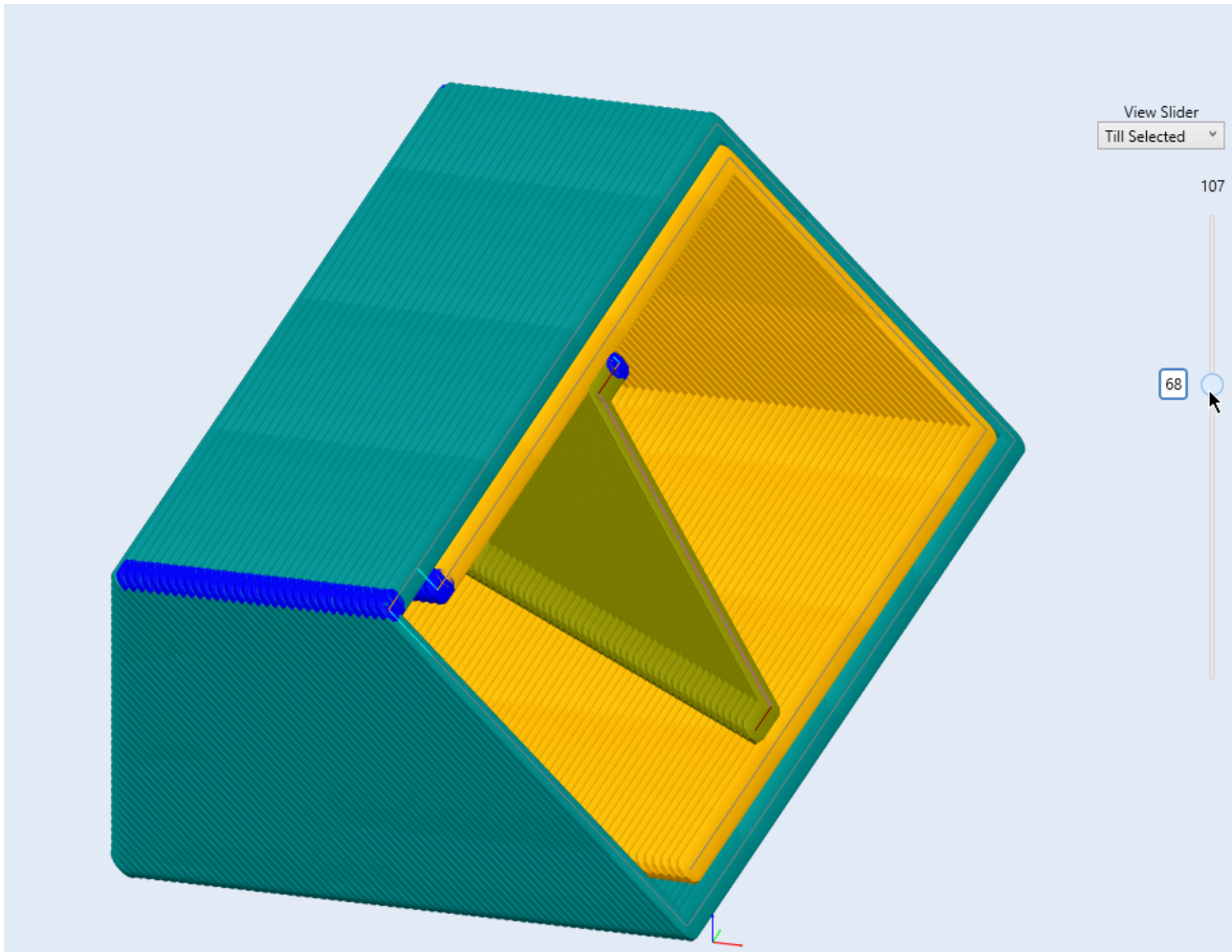
Extend

View Slider

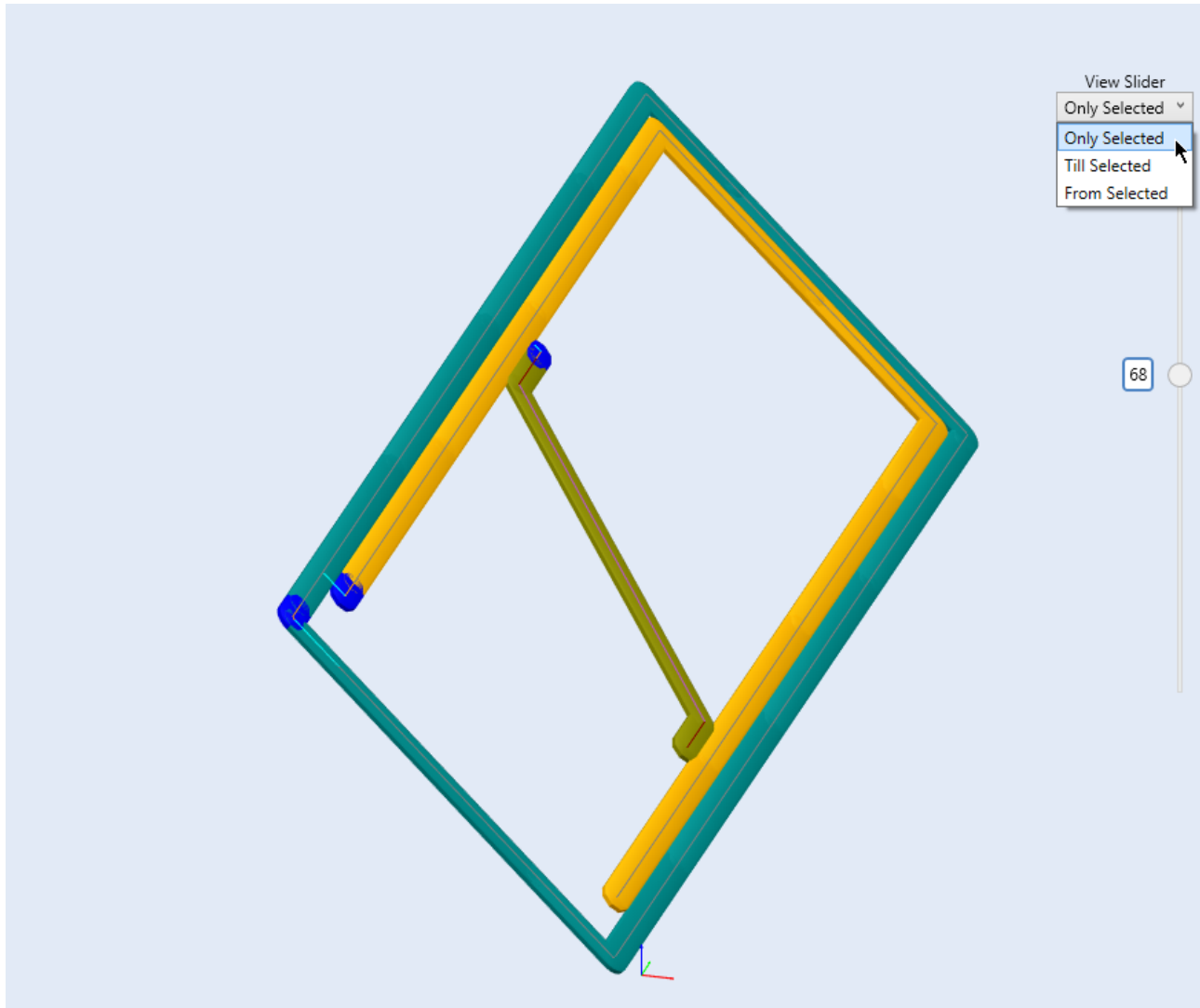
After the slicing is executed it's possible to visualize the solid in different ways. By default, all the solid is displayed, but there are three options for the View Slider. The picture below show the solid entirely displayed because the view slider is set on "**Till Selected**" with 107/107 slices selected.



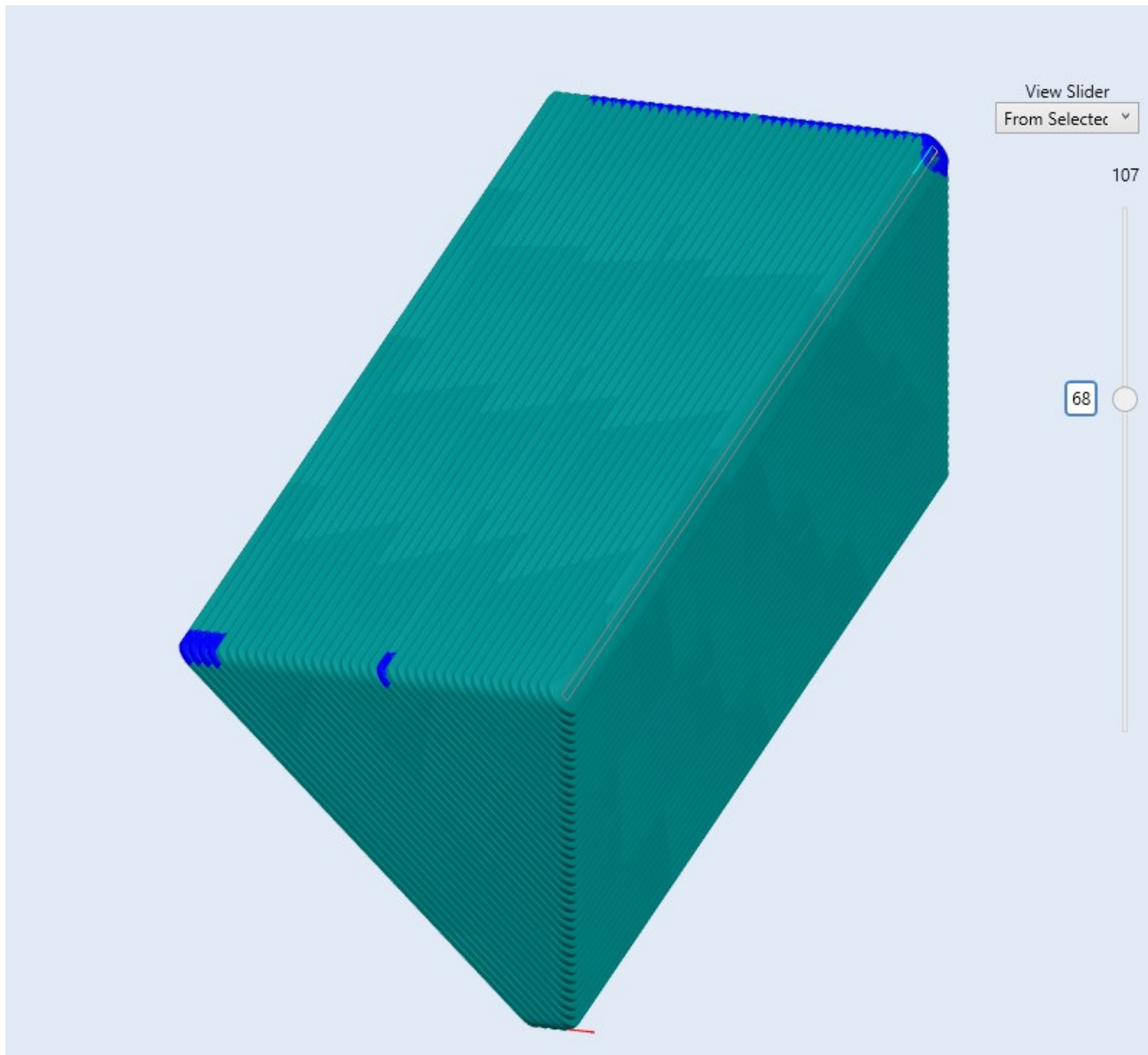
While keeping the "Till Selected" option it's possible to move the view slider up and down to select the desired slice. In the example, we are viewing all slices till the number 68.



In the example we are using the “**Only Selected**” method: in this way we are visualizing exactly and only the selected slice (number 68).



The last option of the View Slider is "**From Selected**": by choosing this all slices will be visualized starting from the one chose with the slider (in the example below we are visualizing all slices from the number 68).



Options

The user can open the **Options** Panel by pressing the button in the top left corner.

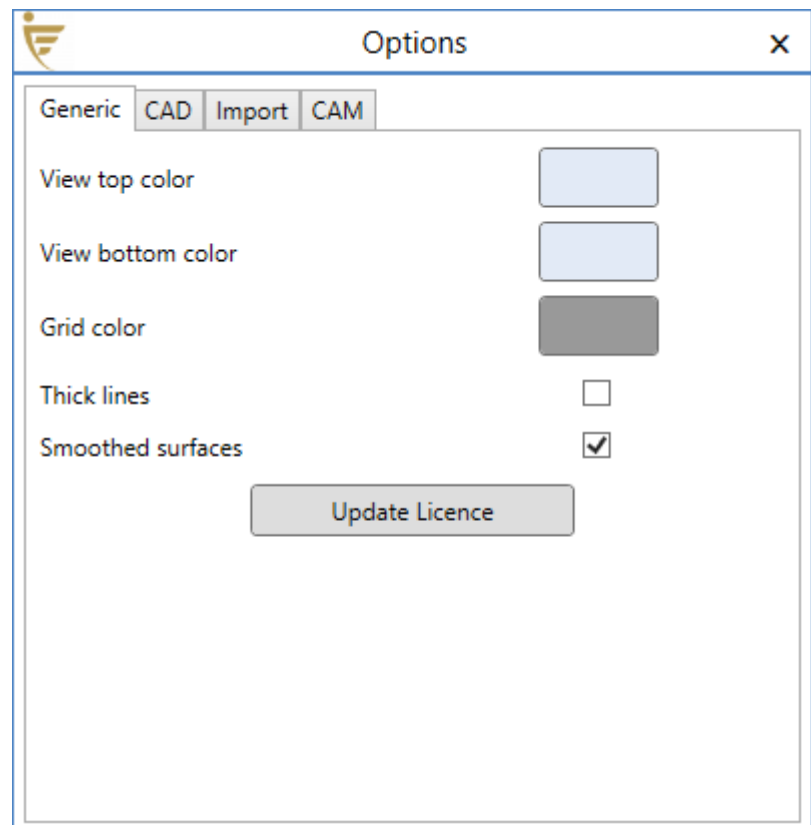


There are four tabs in the Options sections:

- **Generic**
- **CAD**
- **Import**
- **CAM**

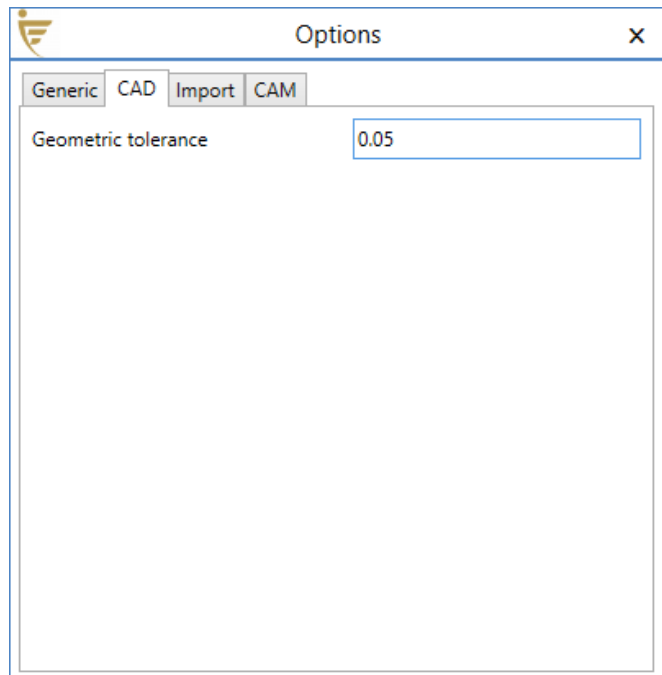
The Generic Tab contains the following settings:

- View Top Colour
- View Bottom Colour
- Grid Colour
- Thick Lines
- Smoothed Surfaces
- Update licence



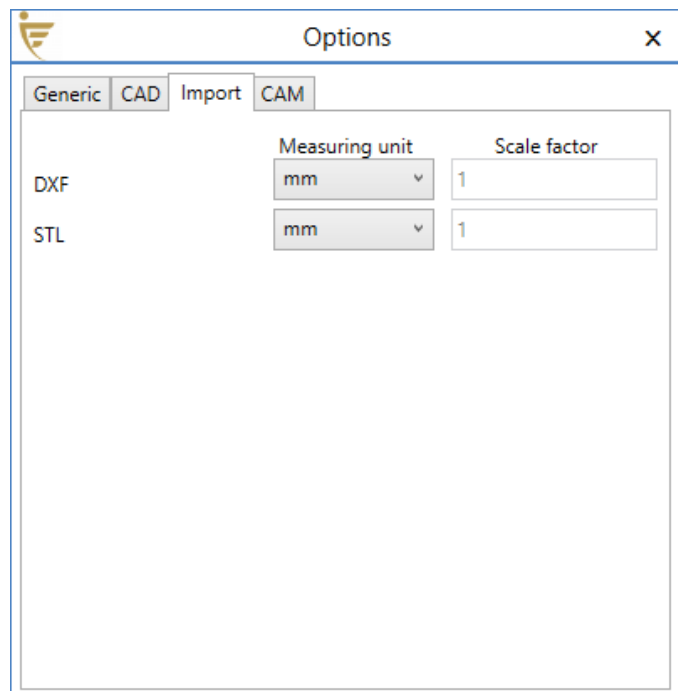
The CAD tab allows the user to set a specific Geometric Tolerance for the project.

This influence the approximation when importing a file in Icarus and usually it must NOT BE MODIFIYED by the user, except for particular cases.



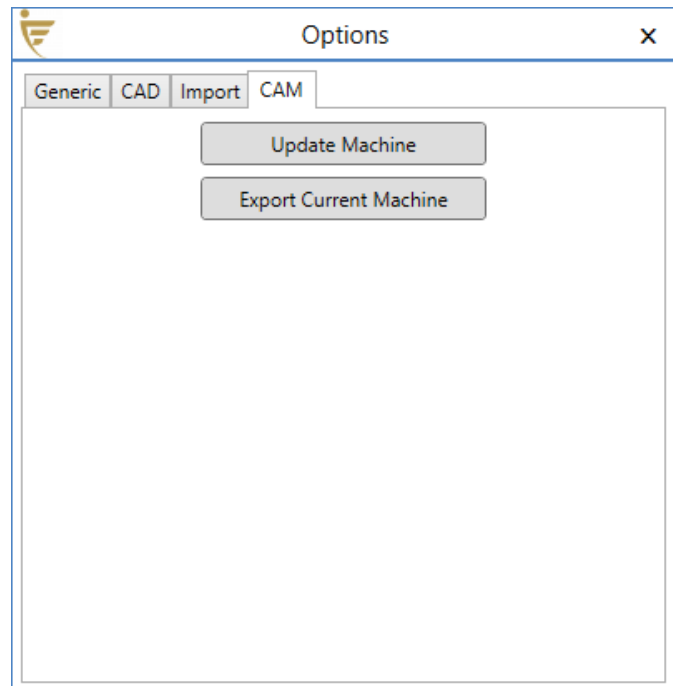
The third tab is the Import TAB.

It is used to configure the scale factor when importing DXF and STL files, and to specify the measuring unit (default is millimetres)



The last Options Tab is the CAM tab.

Here the user can Update the current machine or export it by pressing the relative buttons.



Contacts

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