3DXPERT-QUICKGUIDE

Tutorial_V5 - Updated: 13,0601,1489,1679(SP6P1)

Introduction

3DXpert is the All-in-One Software Solution for Metal Additive Manufacturing.
It has all the tools to prepare your part for printing and send it to your printer.
This short exercise will guide you through 3DXpert's basic workflow.
You will create a new project, load a part and prepare it for printing.
In between, various tips on using the software are included.

General Guidelines

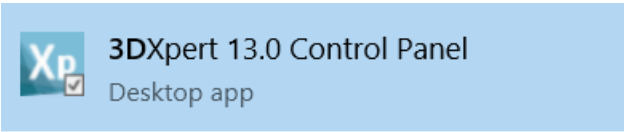
This guide will help you do your first step with 3DXpert, learn its interaction and understand the workflow.
However, this is not substitute for the complete training kit of 3DXpert. To understand what each parameter or option does, check the On-Line Help supplied with the product (press F1 to access) or the dedicated training materials.
This document is also not a guide for printing techniques. The information supplied here should only be used as a guide on how to work with 3DXpert.

Printer & Material Configuration Files

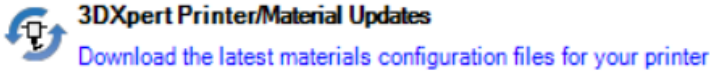
The topics discussed here are applicable to any 3D metal printer. Therefore, for the training purpose of this guide we will use a fake printer.
Although the name of a real printer will show on the tray, its parameters are not relevant to any current real printer and are not ready for actual printing.
The training printer & material configuration files are supplied with this guide.
After the installation of 3DXpert, install the contents of the file 'ProX DMP Training.rar' to the folder -
C:\ProgramData\3D Systems\3DXpert\13.0\Data\3D_Printing\Technology_Folder

Before starting, make sure your 3DXpert is installed and that you have a valid license.
For more information on this, see also 3DXpert-Getting started document.

The actual 3DSystem validated printer & material files for your printer are available for download from the dedicated 3Dsystem web server.
To download these configuration files, launch the 3DXpert Control Panel from the Start menu



From this Control Panel launch the Printers & Materials update too.



Select your printer and download the files (they are compressed in a zip file).

Extract the content of the material file into the printer folder of your installation. For additional information on installing the material files, consult your 3DSystems technical support representative.

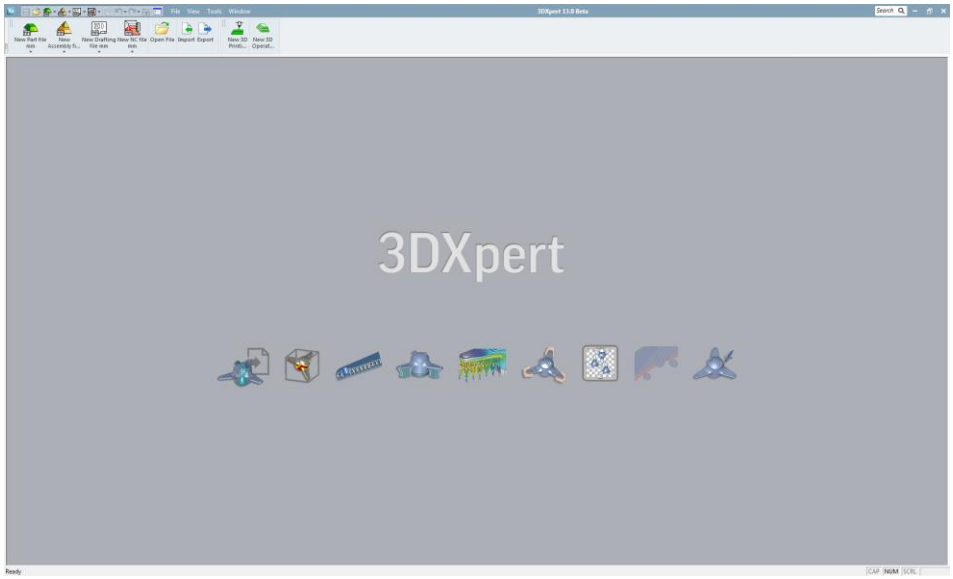
Disclaimer:

The technical parameters and the slicing parameters used in this guide are fictive and serve for training purposes only.
These should not be regarded as recommended settings for actual printing.

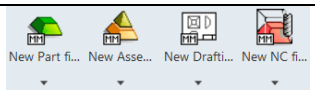
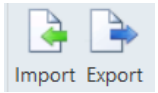
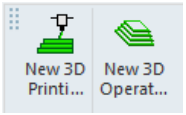
A. Create Project, Load Part and Analyze the Part

1. Launch 3DXpert using the shortcut created on your desktop or from the Windows Start menu.

When 3DXpert is running and no files are open, the initial display is as shown below.
The display of some of the elements that make up the system initial window depends on your 3DXpert license.

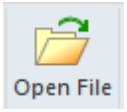


The buttons shown on the initial display are:

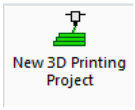
	Create a new 3DXpert file of type*	Types are: Part, Assembly, Drafting or NC
	Open File	Open an existing 3DXpert file
	Import/Export	Read/Write a CAD file from/to any format**
	The 3D Printing Projects	

*Depending on License (the NC requires additional license)

**3DXpert supports various mesh formats such as STL, OBJ,3MP & PLY and Solid/Surfaces (B-rep) formats.
B-rep formats can be SAT, IGES, STEP and others or direct formats such as Creo, Catia, NX, Solidworks and more…
The full list with supported versions of each products appears in the On-Line Help under '3DXpert 13.0 Import/Export Capabilities at a Glance'.

If you wish to load an existing 3DXpert file or project, use Open File. 

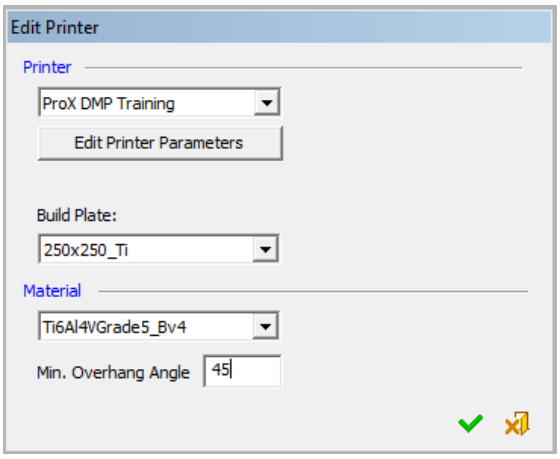
Since we are starting now a new project, we will create a new 3D Printing project.

2. Press the ‘New 3D Printing Project’ 

   A new project opens up, showing the default printer (tray). If this is the first time 3DXpert is running after the installation, the default printer is ‘My Printer’. Otherwise this will be the last printer you have used on this PC.

   From the Guide Bar click ‘Edit Printer’ and select the Printer Name from the list.

   Select the printer ‘ProX DMP Training’, the Build Plate size (optional) and the name of the Material (metal powder) you will be using.



   The material name is mandatory and therefore, you will not be able to continue unless it is set.

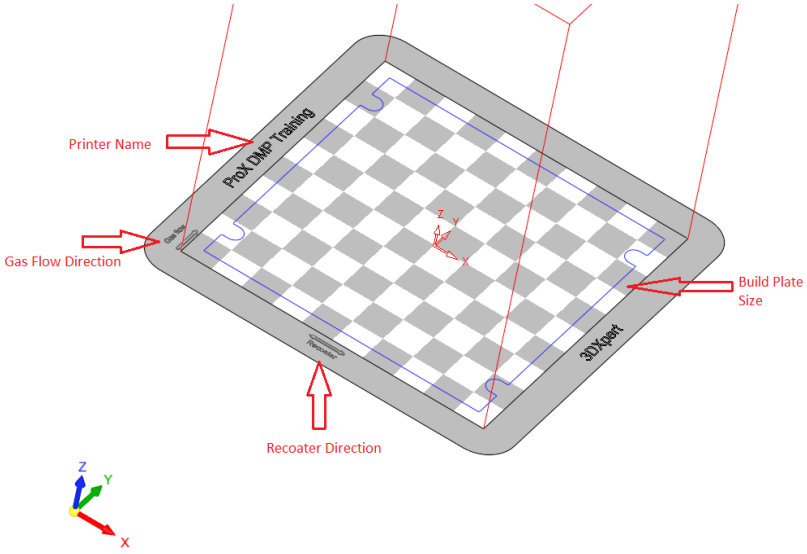
   Set the minimum overhang angle as 45 degrees.

   This angle value serves the purpose of this exercise and in real projects need to be set according to the printer and material in use.

   The overhang angle can also be modified later in various stages of work, either globally or for specific regions.

   Every dimension we will be using or setting here is in millimeters.

Notice the various text showing on the tray:



The gas flow and recoater directions are oriented based on the printer definition.

As you rotate the tray (see later), it become transparent once you look from below.

You can hide the tray or only the surrounding red wires, defining the printable volume.

The 3D Printing Guide Bar:

Notice the guide bar at the right-hand side of the screen.
This guide bar contains most of the 3D Printing tools that you need.
The contents of this guide bar on your installation may differ and show less items, as this depends on your license for 3DXpert. Some items require an additional license.

This QuickGuide briefly discusses the following tools (the number alongside each tool indicates the **step number** where that tool appears in this document):

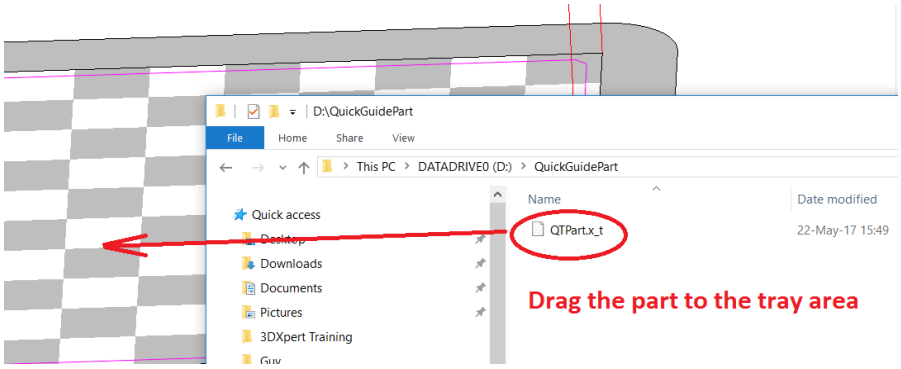
Add 3DP Component	3
Position Body	4
3DP Analysis-Printability Check	5
Support Manager	7-12
Calculate Slices	13
Slice Viewer	14
Print Estimation	15
Send to Operator	17
Send to Print	16

Step 6 discusses Merge, which is not showing on this Guide Bar.

3. The next step is to load the model. The part we use here is a solid model (note that the part we use in this guide is not a mesh based model) that was created by a different CAD system.

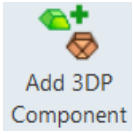
To add the part to the project, open a Windows browser and browse to the folder where the file QTPart.x_t is located.

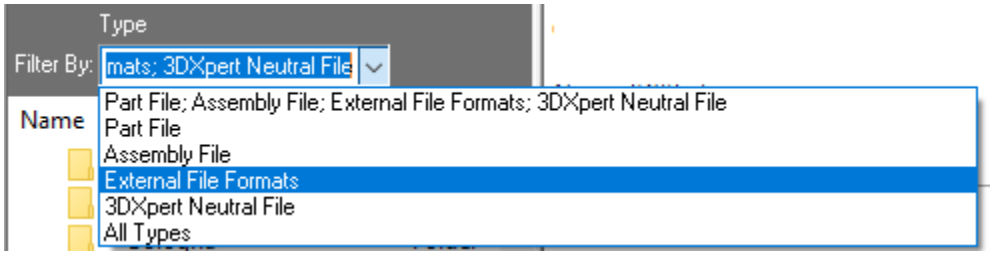
Drag the part to the tray and drop it.



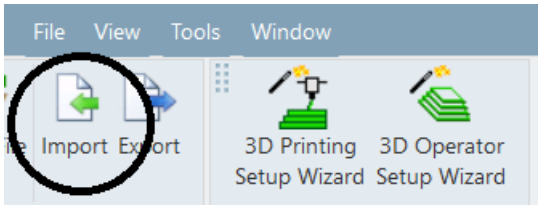
Drag and drop an external file onto the tray

You can also add the part by clicking Add 3DP Component, browse to the folder and set Filter By 'External File Formats', then pick the same file.





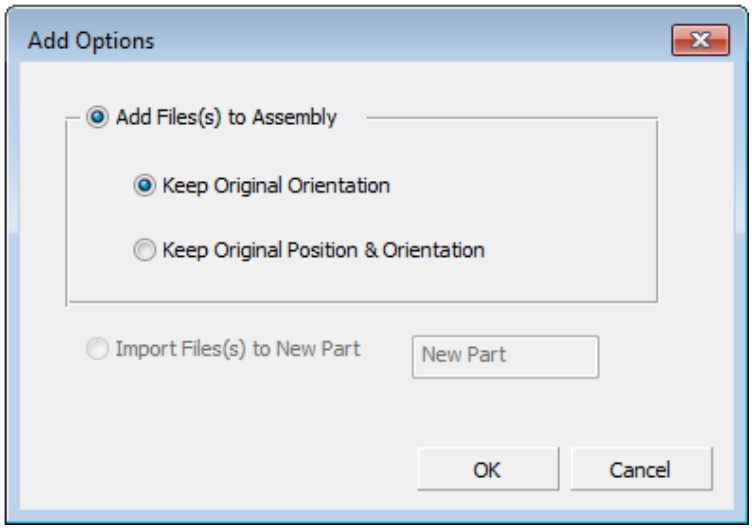
*Note: Files from another software can also be imported separately into 3DXpert using the Import function (3DXpert files get the extension *.elt.)*



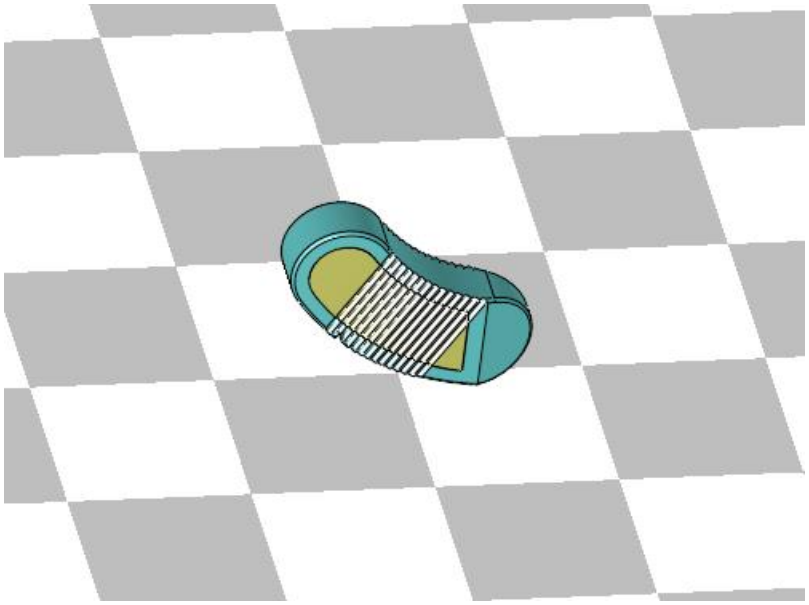
If you already imported the part used in this guide into 3DXpert separately, then the imported part will probably be called QTPart.elt.
Press 'Add 3DP Component' on the Guide Bar and browse to the location where the file for this exercise is located, and then pick the part.

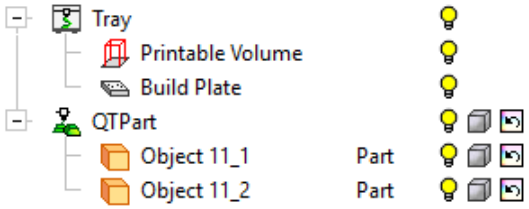
In either way, after the part has been picked, the following Add Options dialog pops up:

Select ‘Keep Original Orientation’ and press the OK button.



The model has been added to the center of the tray:





<u>The Objects Tree:</u>

Take a look at the pane located to the left of the screen, called 3DP Objects.

It shows the structure of the assembly.

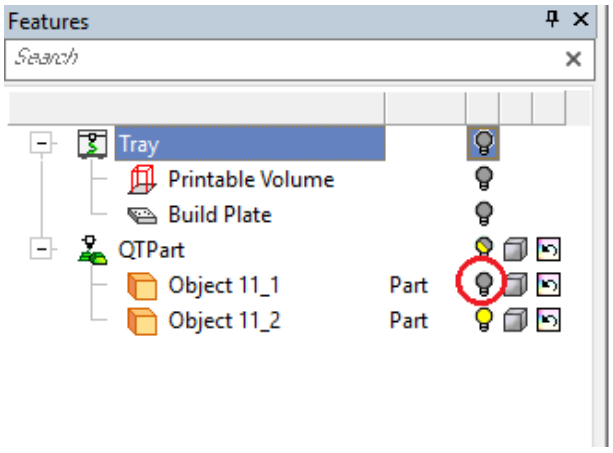
The upper leaf includes the Tray with the Printable Volume Build Plate underneath.

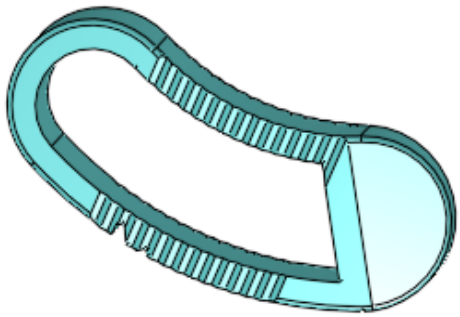
Below them, the two objects show up. These objects were added along with the part we have just loaded on the tray.

The reason for the two objects (instead of one) is that this part is composed of two separate objects. A part can contain any number of objects.

To view each of the objects separately, you can pick one of them from the display and hide or hide by clicking the bulb appearing alongside.

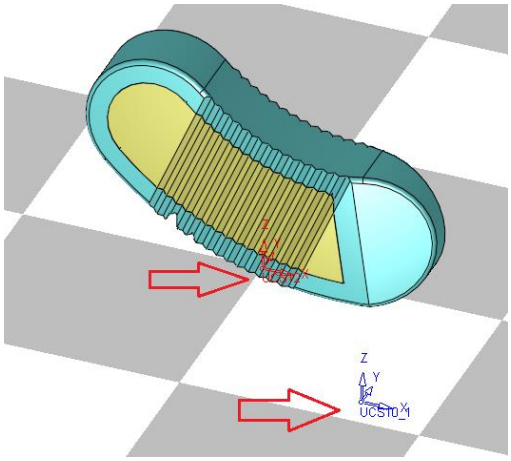
The following image shows one of the objects, once the other is hidden.





Before continuing, let's go through some general commands of the software.

First you may notice that the part comes with predefined coordinate systems (UCSs).



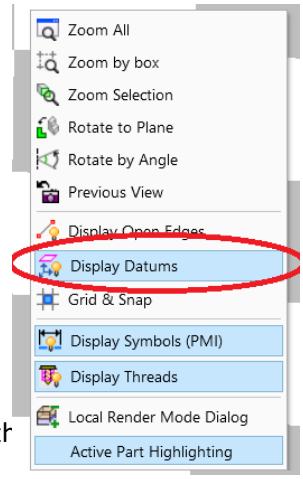
You can hide these in several ways. Let's see two of them.

Click both middle and right mouse buttons at the same time.

This invokes the Display sub menu.

Notice that the option 'Display Datums' is selected, turn it off to hide the UCSs.

In this mode UCS and reference planes and axes are not shown.

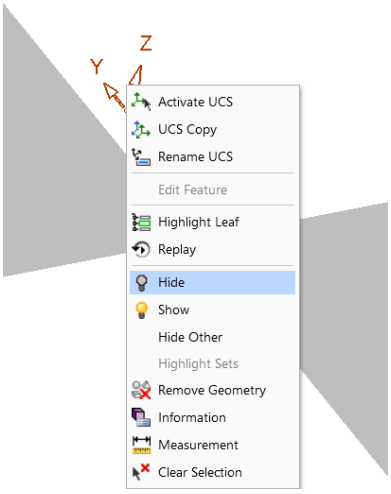


Another way to hide the UCSs is by the context sensitive sub-menu.

Activate the part (since we want to hide only the UCS within the part and not th need to be in the part's environment).

Pick a UCS and right mouse click.

The sub menu which you see is context sensitive, as the options that appear depend on the current situation or selection. Click Hide.



To continue working on the assembly, there is no need to activate it back, as any function on the guide bar will activate it automatically.

More on Display Control:

<u>Rotate\Pan\Zoom:</u>

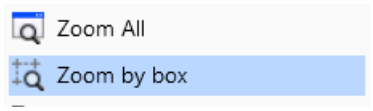
Let's do some basic display operations.

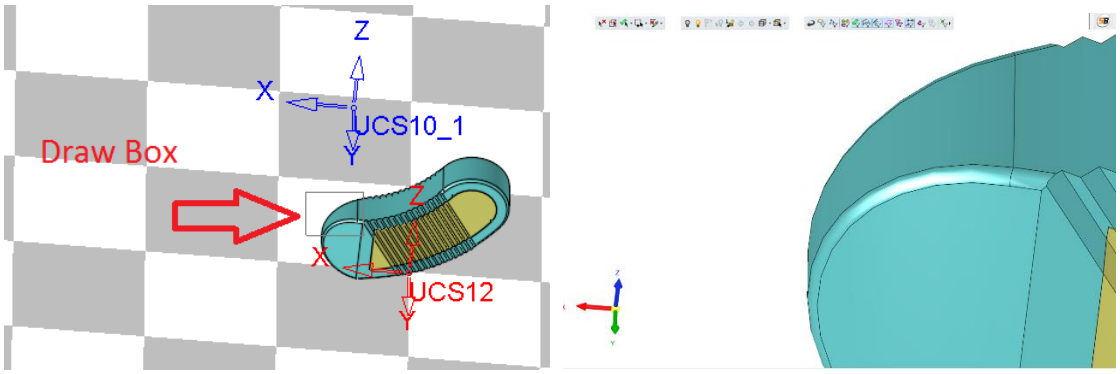
Hold the keyboard's Ctrl button, press your mouse left mouse button and move the mouse – the part will rotate.

While the keyboard's Ctrl button is still pressed, press the middle mouse button, the part will move (PAN) or press the right mouse button to zoom in or out.

An additional way to zoom in/out is to hold the Ctrl button and scroll the mouse wheel.

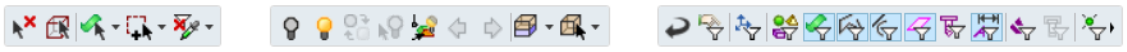
Use the display sub menu (middle + right mouse buttons) to Zoom All (fit the screen to all visible entities or zoom to a specific area by box:





The floating tool bar is located at the top of the display area (centered).

It is divided into 3 segments; each gives control over:

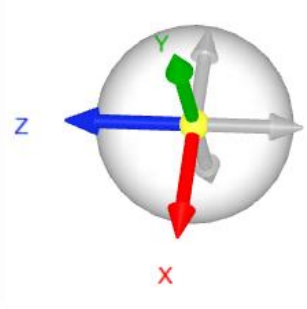


Selection modes	*Visibility*	*Filters*
Of note:	*Of note:*	*Pick a specific type of entity*
Unselect All -	*Pick & Hide -*	
Select All -	*Pick & Show -*	

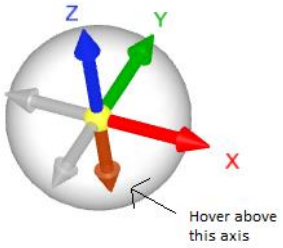
In this exercise we will not work with this functionality. For further information, see the On-Line Help.

Now let's look at the Dynamic UCS located at the lower left of the display area.

As you Hover above the Dynamic UCS, a transparent bubble and transparent negative XYZ axis will show up on screen:



Click somewhere on the bubble and move the mouse around. The view is rotated accordingly. Hover above any of the axis, the axis will be highlighted.

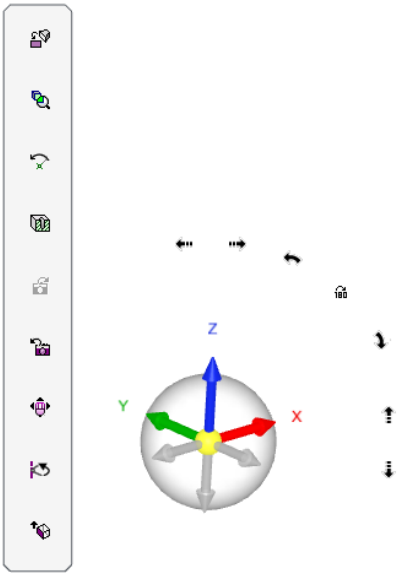


Clicking the axis will rotate the view so that the axis is perpendicular to the display.

As you hover over the UCS, additional guide and controls show up.

The controls to the right of the bubble enable pan\flip\rotate view operation and the guide

To the left of the bubble contains shortcuts to special display controls.



The part is oriented on the tray according to its original design. However, most probably for Printing process the orientation may be a different one.

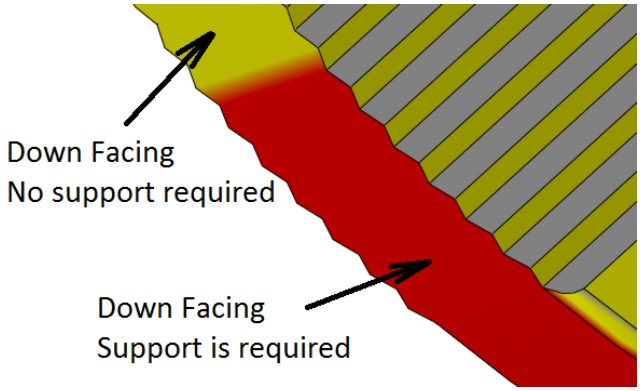
4. Position the Part for Printing.

Press Position Body 

from the guide bar.

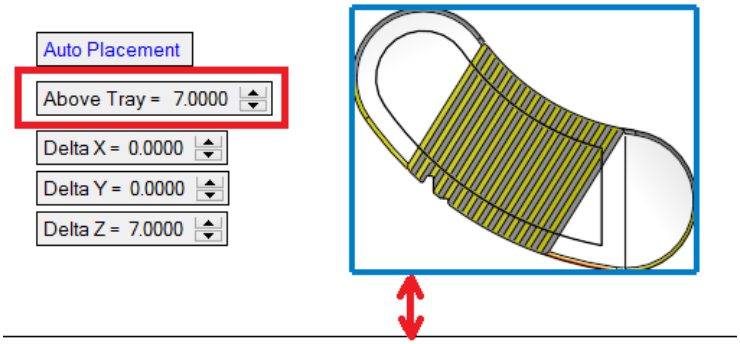
Notice the bounding box around the part. You can dynamically drag and rotate the box by picking any of its edges and moving the mouse.

As you drag and rotate the part, notice that the down facing areas are colored in yellow and that the areas requiring supports (depending on the overhang angle) are marked in red.



Let's first set the height of the part above the tray.

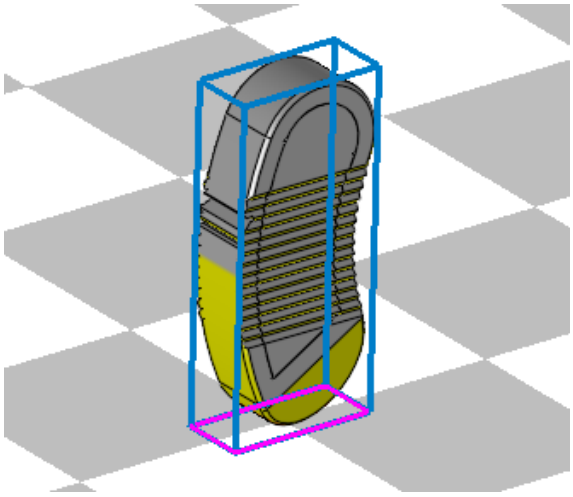
Set 'Above Tray' as 7mm. This makes sure that part will not go below this height.

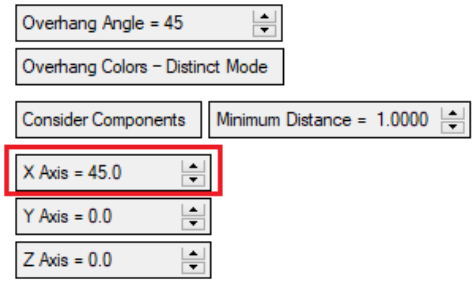


Next let's set a different orientation for the part.

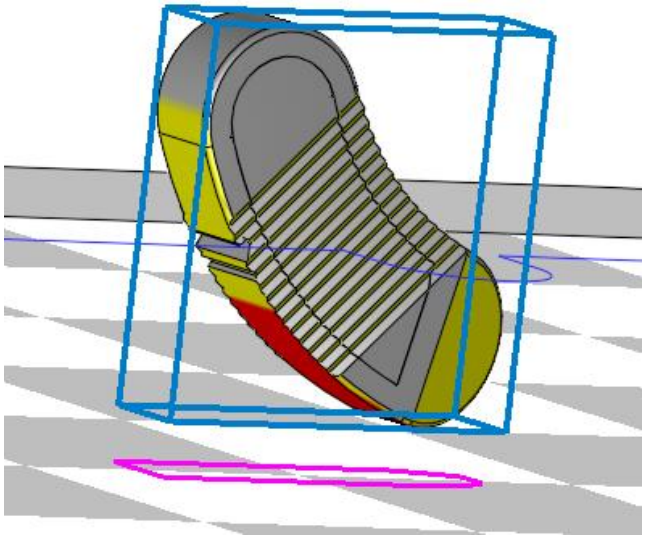
The system can help you find the optimized orientation based on several rules.

Set the orientation method to ‘Minimize Tray Area’ and click the Auto Orientation button.

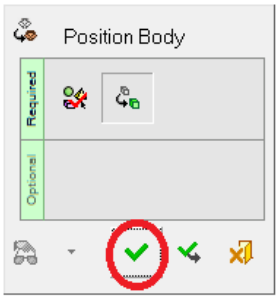




Set rotation along the X axis by 45 degrees



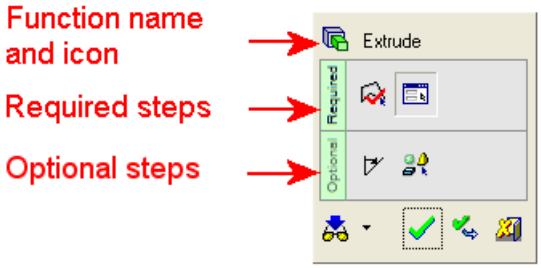
To confirm this position and orientation, Right mouse click and press the OK button.



<u>More on 3DXpert's Feature Guide:</u>

Most 3DXpert functions are implemented by a series of steps. These steps can include selecting geometry, defining parameters, defining direction, etc. To simplify the process of each function, a Feature Guide is provided to walk you through the required and optional steps of each function.

The Feature Guide has the following appearance:

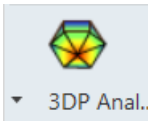


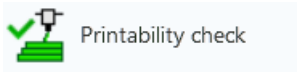
	Auto/Manual Preview: Preview the result without executing.
	OK: Execute the function.
	Apply: Execute the function without exiting.
	Exit: Exit the function without executing.

From one step to the next:

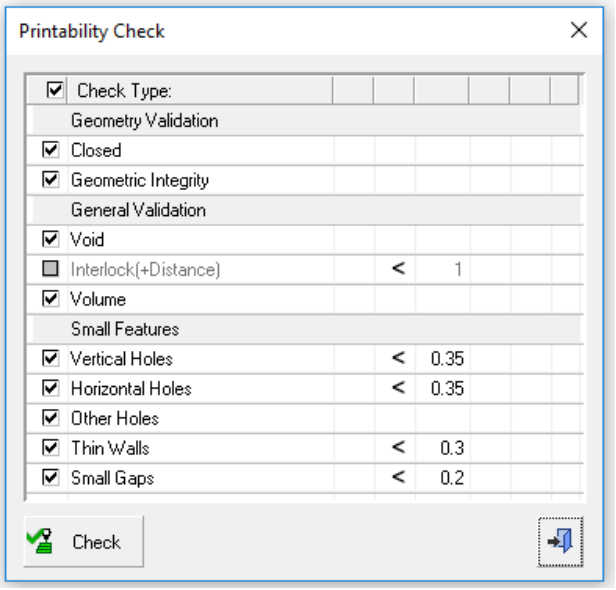
Once you are done selecting/defining data in one step, proceed to the next step by pressing the middle mouse button.

5. Let's perform a Printability Check, to ensure that the part is ready for printing. This 'check' is actually a collection of several analysis tools, verifying that the model is topologically ready for slicing.

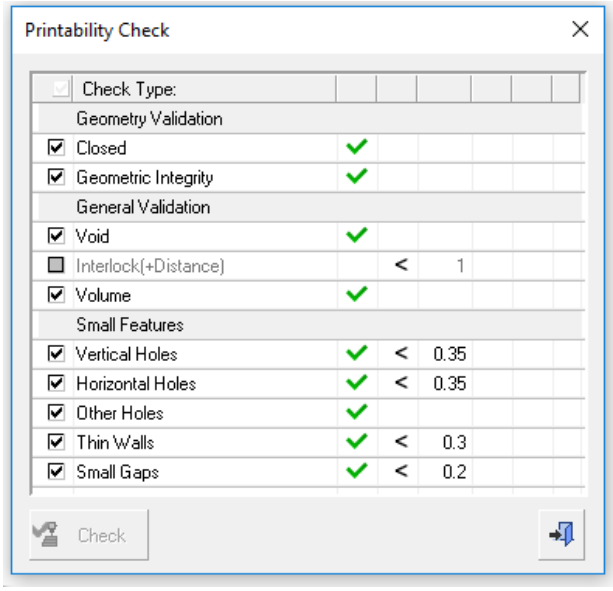
Click 3DP Analysis-Printability Check 

and then 

Press the Check button at the bottom of the dialog



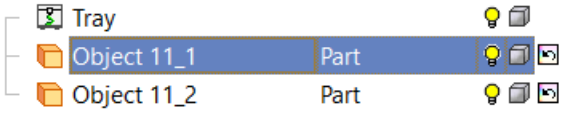
Here are the results: The part is OK.



Close the Printability Check dialog.

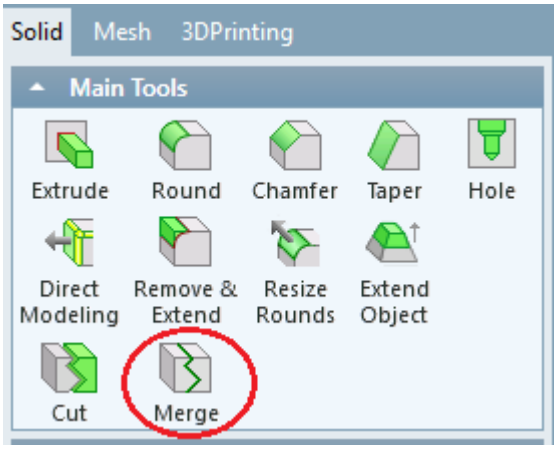
However, remember that this part is consisted of two separate objects. We would like to consolidate them into a single object. We will merge these objects into one object.

The Merge operation is done within the Part environment, so to activate the part, **double click** any of the objects names on the tree.

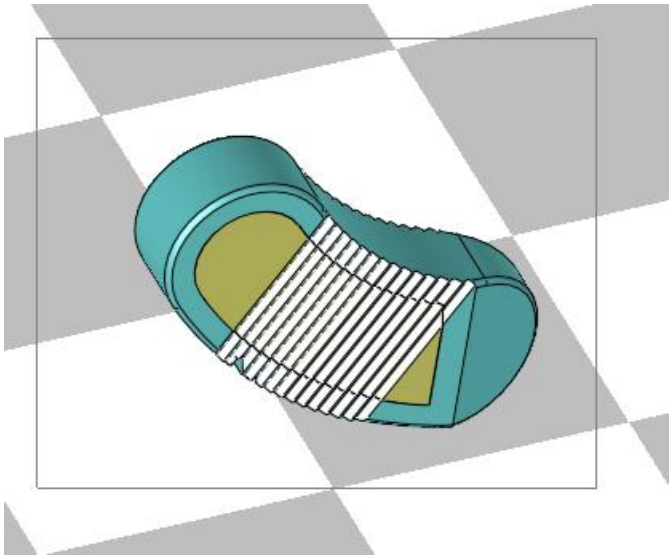


The part is now Active.

6. From the Menu select Solid – Merge

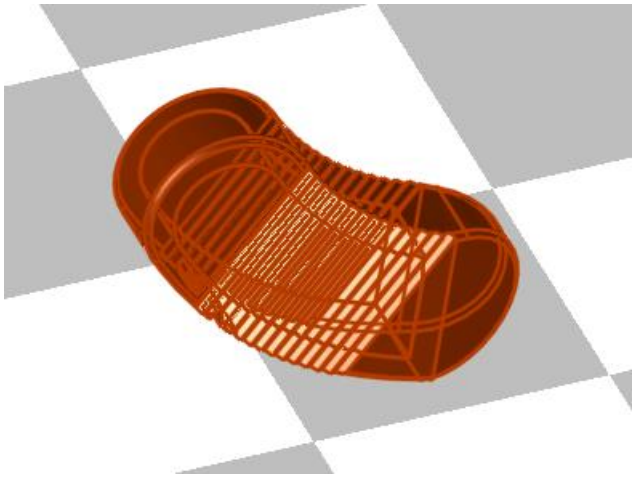


Press the Left Mouse Button and select the whole part (the two objects) by box



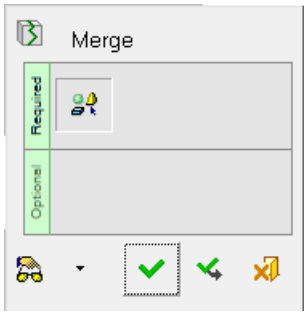
Selection by Box

The selected objects are highlighted in red

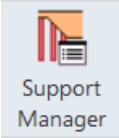


Right mouse click anywhere on screen and on

The Feature Guide press the OK button.

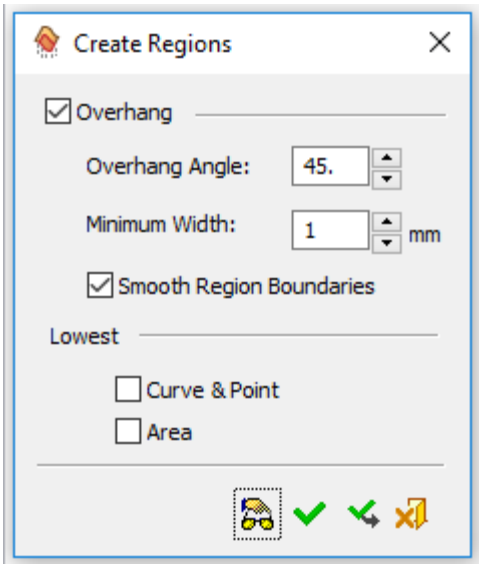


B. Create Region & Supports

7. Enter the Support Manager 

   Keep the overhang angle value (45) but set the Minimum Width for regions as 1mm.

   Uncheck the two Lowest options (keeping these options will result in additional regions).



   Note: Lowest options are not checked

Press OK.

The result of the analysis is presented on the table and in addition, the regions are drawn on the model itself (by the yellow contours).

The system has created 3 closed regions.

These are the support regions created according based on the overhang angle and the minimum width.

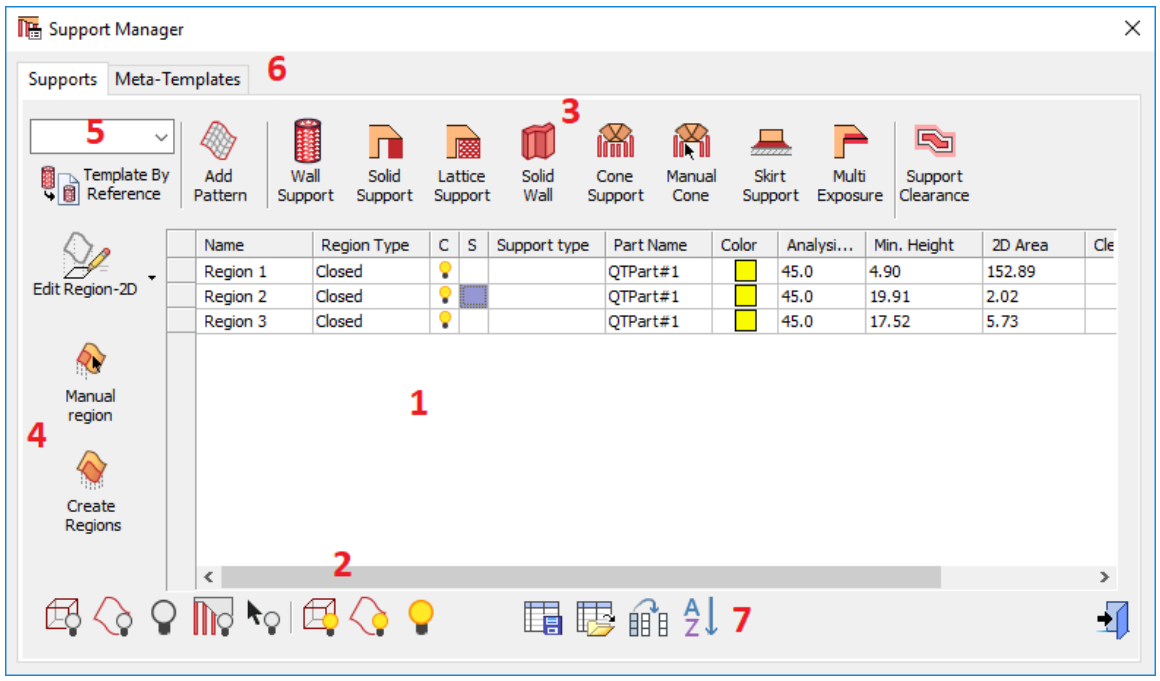
You can decide if you want to build supports on any region or not. It is also possible to modify them or to create your own support regions.

If you kept the Lowest options checked, additional open regions will populate the Support Manager. You can delete them or simply disregard them and continue to the next step.

More on the Support Manager:

The Support Manager dialog is composed of the following:

1. *Table of regions created on this part. Every line is a different region with its parameters and supports.*
2. *Visibility buttons for regions and supports*
3. *Support creation tools*
4. *Tools for creating and editing support regions*
5. *Apply Template & Template by Reference*
6. *Meta Templates*
7. *Dialog Settings*



The Support Manager

Pick some regions on the screen and see that the relevant rows are highlighted. This works vice versa too.

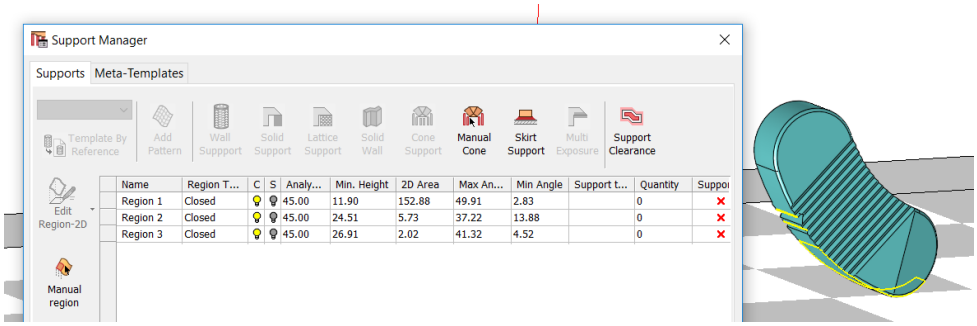
3DXpert offers a rich set of support generation tools:

- *Wall Support*
- *Solid Support*
- *Lattice Support*
- *Cone Support and Manual Cone*
- *Skirt Support*

In addition, you can define a region as Multi Exposure (self-support volume within the part).

In this QuickGuide you will create Wall Supports.
To learn more about supports' creation tools, refer for the 3DXpert training kit.

We will create supports on the 3 regions created by the system.

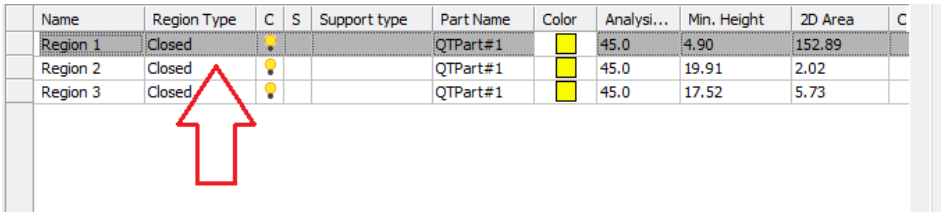


Notice the 3 rows on the table and the 3 contours on the model.
Each one is a Support Region.

8. Creating Supports – Wall Supports.

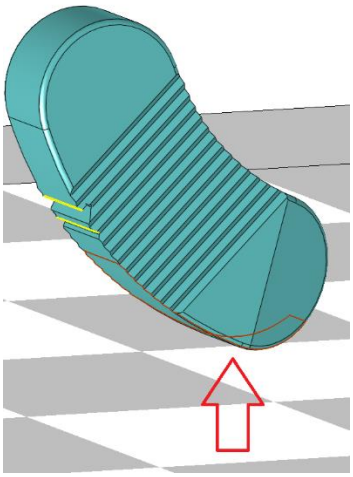
   Pick the largest region from screen.

   Notice that the relevant row for this region is also marked on the support manager.



From the Support Manager menu press

Add Pattern 



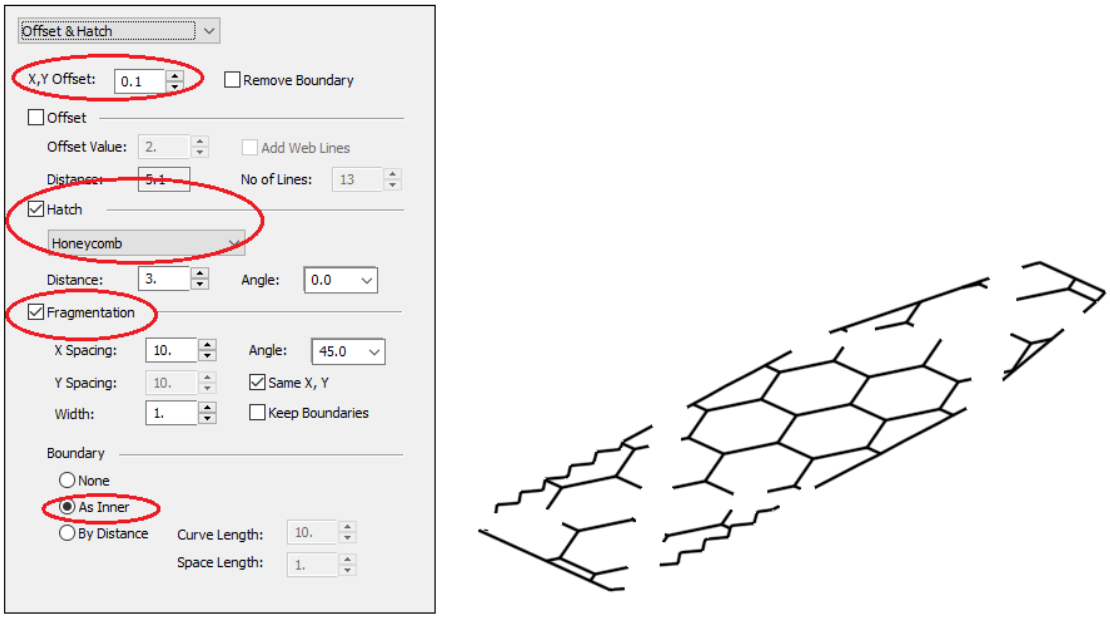
The pattern that you have selected is projected onto the tray.

Set the X,Y offset as 0.1mm. This puts the boundary of the pattern inwards by this offset value.

From the Pattern list, select a Honeycomb hatch pattern.

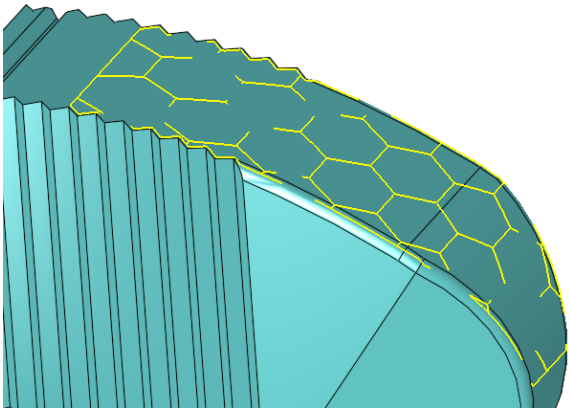
Add fragmentation of the inner walls plus the boundary – set Boundary As Inner.

The parameters described above are marked in the following image:



Right mouse click on the display and press OK on the Feature Guide.

The pattern is now projected back on the model.



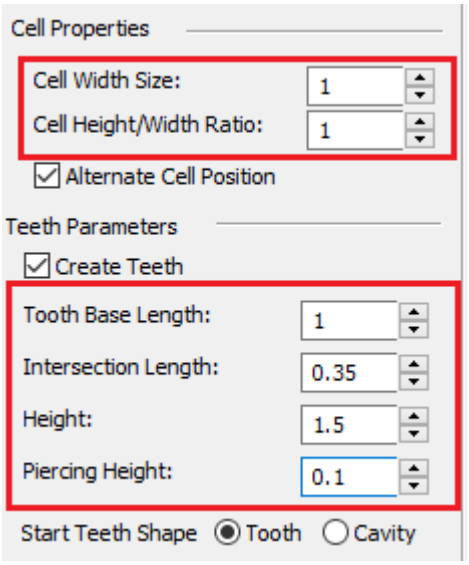
The pattern projected back on the model

9. You are now back to the Support Manager. Click the region and press the Wall Support button. 

There are many parameters for Wall Supports. We will focus here only on a few of them.

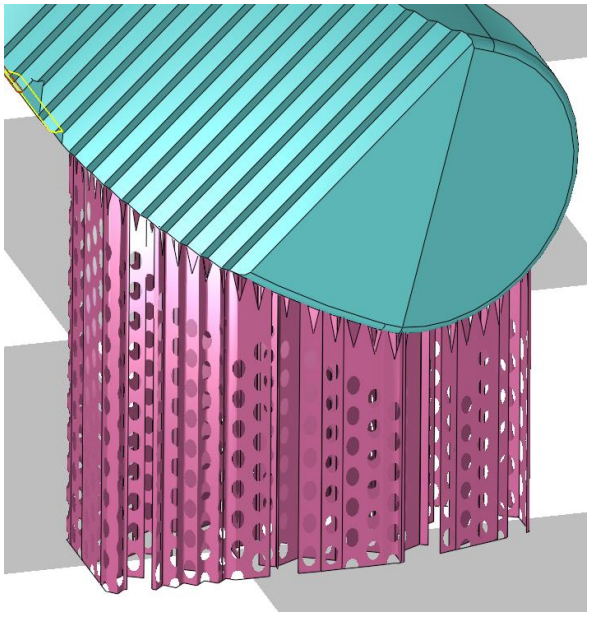
Use a wall with texture, keep the default texture.

Set the following parameters:



Settings for the Wall Support

To approve the creation of the wall support, right mouse click and press the OK button.



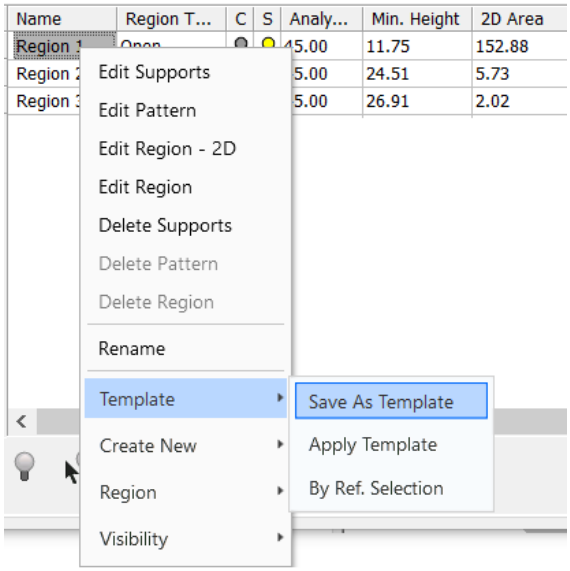
You have now created a support on one of the three regions.

In the same way you can create support on the remaining two regions.

However, with 3DXpert you can create support faster by using templates.

10. We will now save the rules to create the Pattern and Supports of this region into a Support Template.

    Right mouse click the region and select Template-Save As Template from the sub-menu:

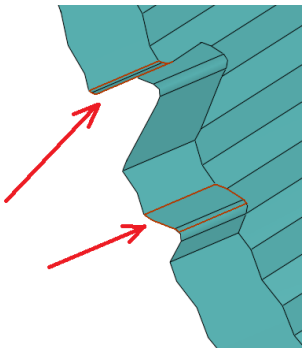


Enter a name for the template

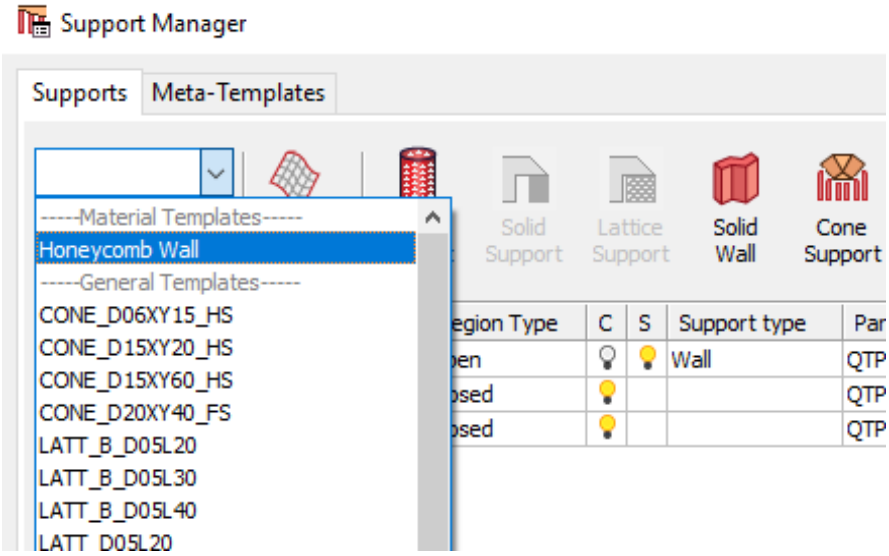
and press the OK button.

11. Applying the template.

    Pick the other two regions

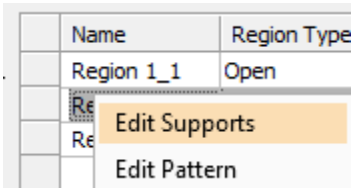


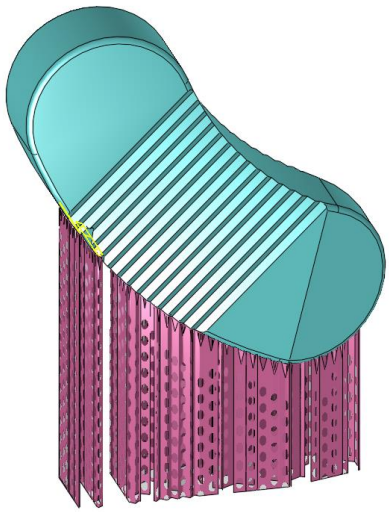
Press the Template box and select from the list the template name you have just created.



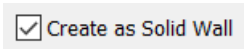
Although the supports were generated by a template, we can still edit them individually.

12. Edit the outer wall support: Either double click the support on screen or Right mouse click Region 2 and select from the sub menu Edit Support

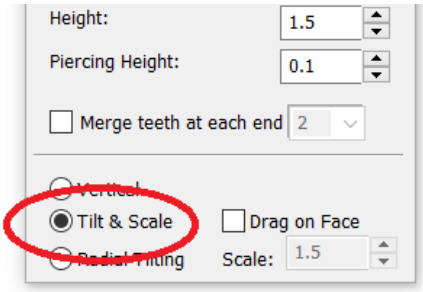


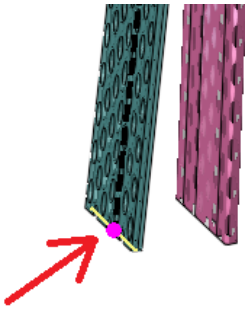


In the Wall Support Dialog set External Boundary as Solid Wall.



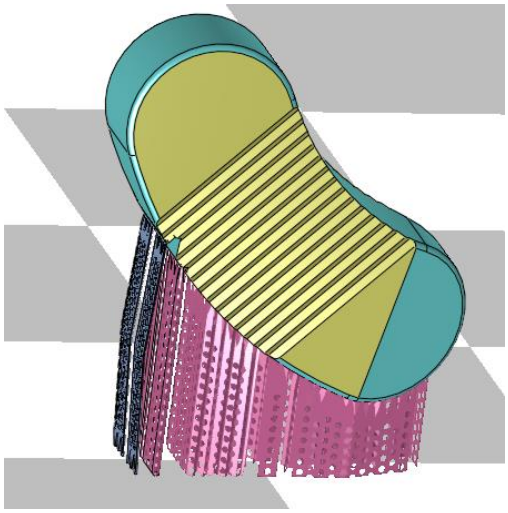
In the bottom of the dialog switch from Vertical to Tilt & Scale. Pick the tilt line at the bottom and drag it a bit.

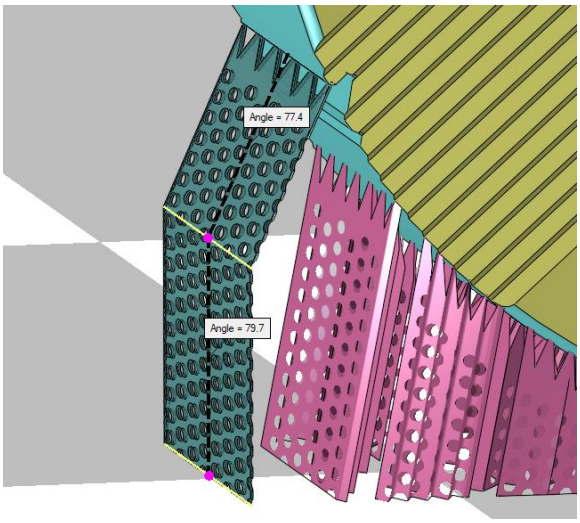




Next, pick the tilt line around its middle and drag it a bit.

Right mouse click and press OK.

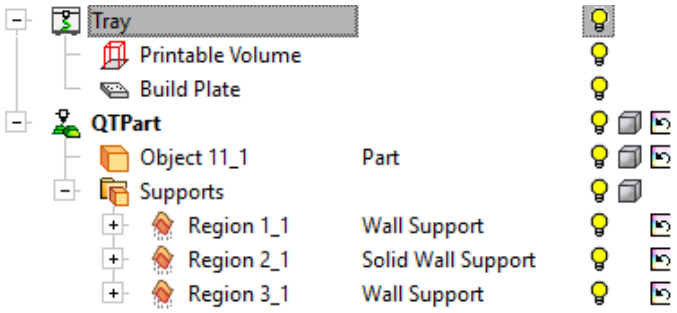


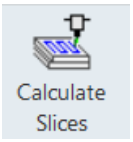


See that the Supports that you have created were also added as objects to the 3DP Objects tree.

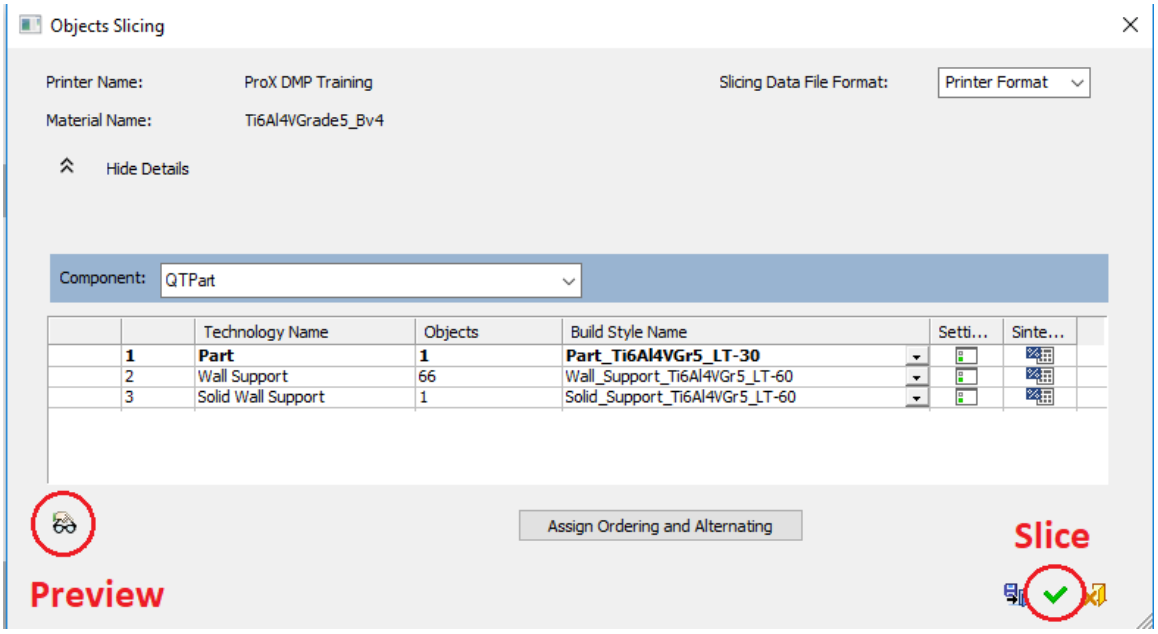
Notice also the Technology Name appearing alongside each object. This name identifies the slicing technology to be used for the specific object.

The model is now ready for slicing.



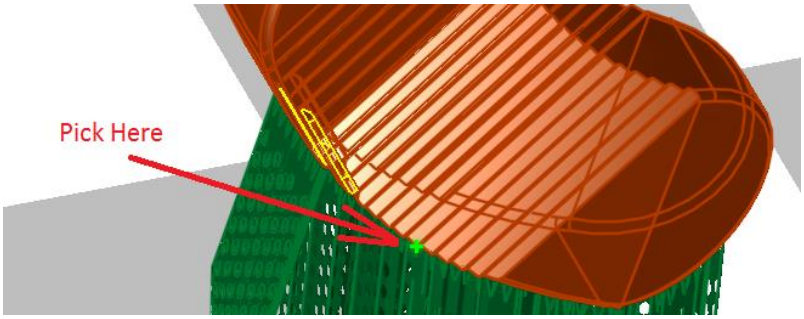
13. Press Calculate Slices 

The upper area of the dialog shows the technologies used for slicing.



Before the calculation of the slicing, you can preview specific layers.

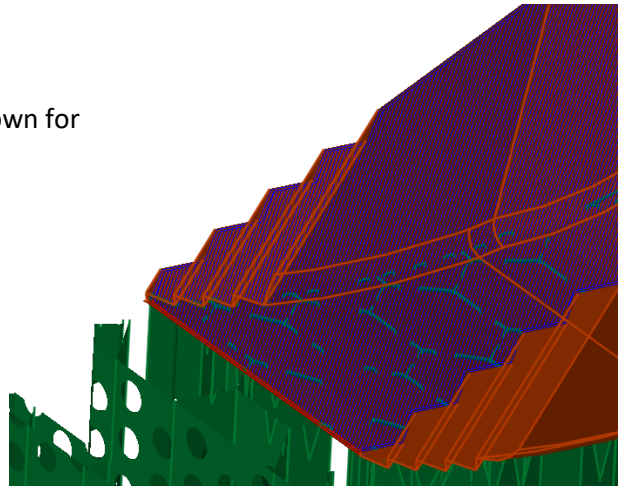
Select Part from the list of Technology Names and press the Preview button. Pick on screen anywhere on the part to see the slicing on that specific layer.



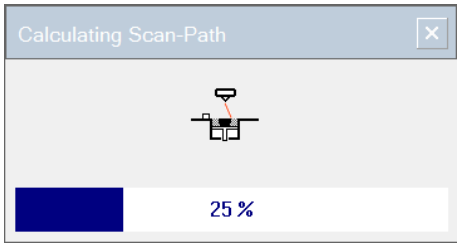
Slicing preview of part for a specific layer:

Zoom in closely to see the scan path.

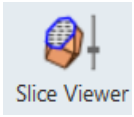
As we selected Part for preview, the scan path is shown for the model only, not including the supports.



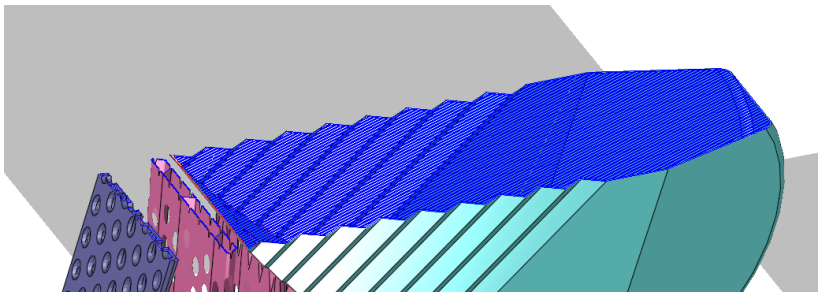
Back in Object Slicing dialog, click the OK button to run slicing and wait until the calculation ends.



14. After Slicing is done, you can view the results.

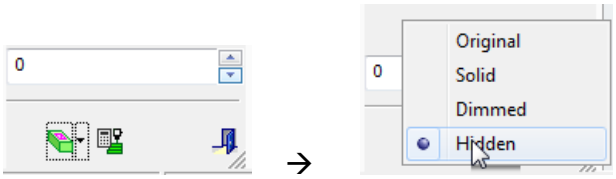
Enter the Slice Viewer. 

Move the bar up and down to see the Scan path in each layer.
Note the slicing for the part as well as the supports.



Zoom in closely to see the scan path.

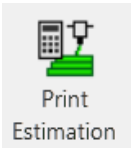
Set the display control to hide the tray and model. This will show only the scan path.



To clearly view of scan path, set the view orientation to be from top view (click the Z axis if the dynamic UCS) and hide the model as described above.

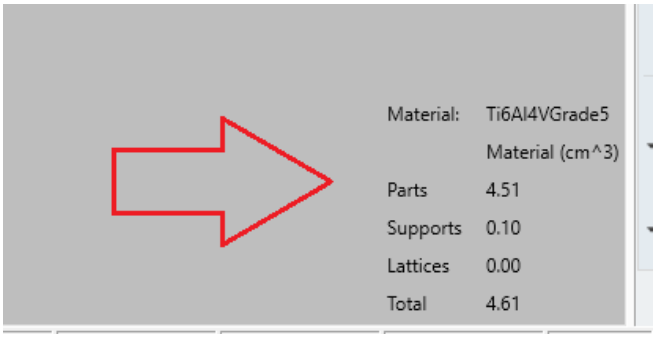
> *Scan path results may differ from one material to another.*
> *The scan path result depends on the preset material configuration files (also called 'Buildstyle'.)*
> *The scan path result you see here is based on the specific Buildstyle defined for the material used for training purposes.*

Exit the Slice Viewer.

15. Create a Print Estimation Report. 

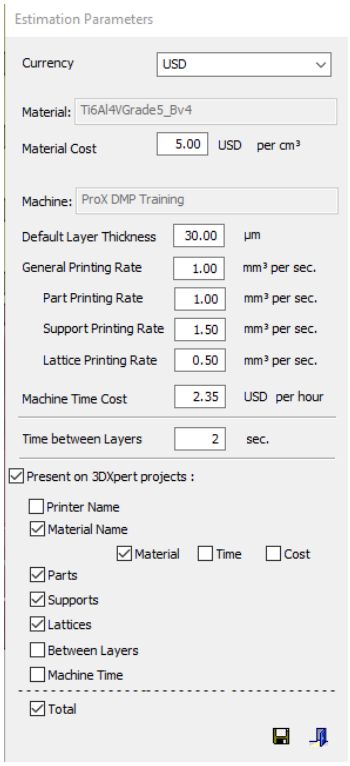
A Volume Base Calculation is always available, even if slicing is not performed.

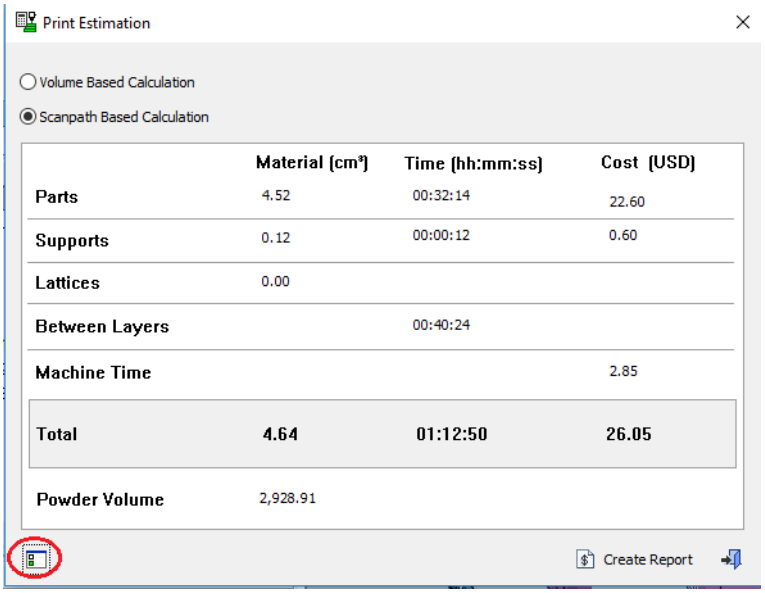
Note that as you worked on the part, the system updated the material in use (volume).



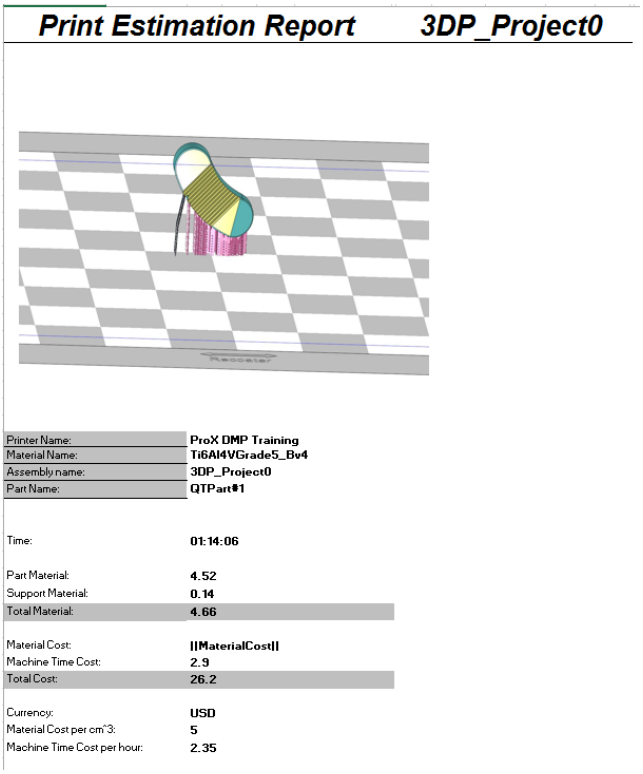
As we did calculate slicing in this part, we can use the more accurate Scanpath Based Calculation.

Press Print Estimation. The option 'Scanpath Based Calculation' is selected.
Click the Print Estimation Settings to enter the currency, material cost per unit volume and cost of machine time per volume unit.
You can set also the Time Between Layers (this is usually the time needed for each powder recoating cycle).





When done press the Save button and then press Create Report. Use the default Excel template and OK.



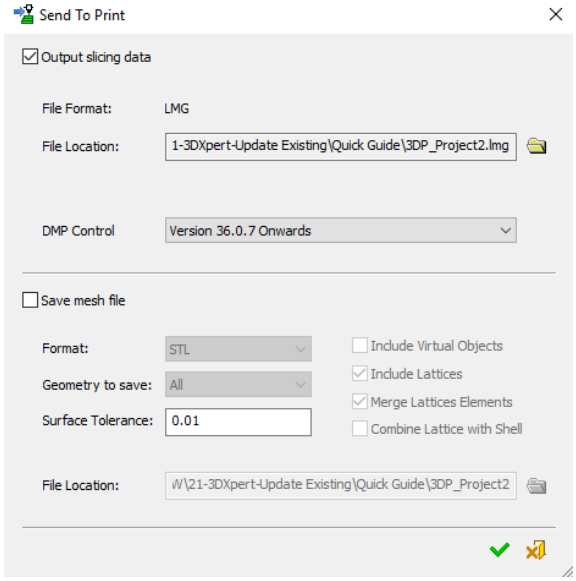
Print Estimation Report **3DP_Project0**

Printer Name:	ProX DMP Training
Material Name:	Ti6Al4VGrade5_Bv4
Assembly name:	3DP_Project0
Part Name:	QTPart#1
Time:	01:14:06
Part Material:	4.52
Support Material:	0.14
Total Material:	4.66
Material Cost:	||MaterialCost||
Machine Time Cost:	2.9
Total Cost:	26.2
Currency:	USD
Material Cost per cm^3:	5
Machine Time Cost per hour:	2.35

Sample Print Estimation report

Exit the Print Estimation dialog.

16. To create the file that will go to the printer, press Send to Print.



Simply press the OK button to create the file. The format of the file depends on the printer. This training printer output to LMG format.
You can also export the geometry (model and supports) as mesh.

Press the Save button (located at the Quick Access Toolbar) to save the project on your PC.

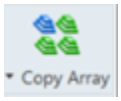
In the Browser, set the folder to save the files, enter the name for the project and approve.

You have prepared the part for printing and sent it to the printer.

The next section discusses working with multiple parts.

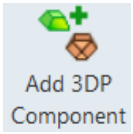
C. Printing Multiple Parts

You can add additional parts to the tray, put them in array (nesting), slice and send them to print.
This functionality has been added to 3DXpert since version 13SP6P1.



However, this Quick Guide is a short guide to 3DXpert's envelope and as such, we will show here how to work with the Operator environment.

Loading Multiple parts: Add 3DP Component vs. Operator:



3DXpert has two environments.

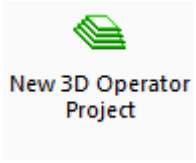
The first environment is the 3D Printing environment. It is designated for the part preparation, support design and slicing of the part. You can also send the part to the printer. You can also add more parts on the tray, arrange them on the tray, slice and send to print.

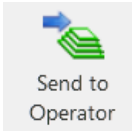
The second environment is the Operator environment. It is designated for tray arrangement of prepared and sliced parts and sending the entire build platform to the printer.

The Operator environment is a friendly environment that can be used as an on-machine environment. Parts that were sliced in the 3DP environment can be arranged on the tray and sent to the printer.

Once you have a sliced part, you can invoke the New 3D OperatorProject and load the part on the tray .

However, if the 3D Printing project you are working on is open, select 'Send to Operator' from the guide bar .





The system asks you to save the work before continuing, press Yes.
As the Browser opens up, enter the name for the new Operator project.

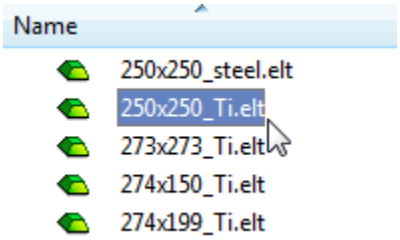
The Operator Guide Bar:

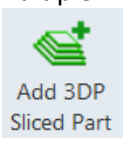
The Operator environment includes the tools to load different parts on the tray, position them, set their printing order and send to print.
Notice that in the Operator environment, the guide bar showing to the right is different than the one we saw in the regular 3D Printing environment.

This environment does not contain the various CAD and preprinting preparation tools. Only sliced parts, part files that were saved in 3DXpert after a slicing calculation has been performed – can load on the Operator.

17. Press the button to Add a build Plate 

and select via the browser the plate to use.

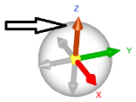


In this exercise we will send to print multiple instances of the same part, however if you wish to add another sliced part, click 

.

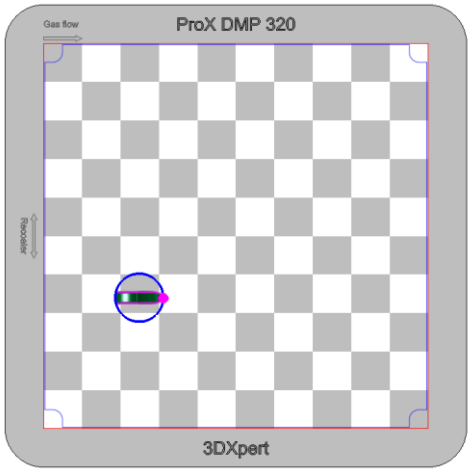
18. Click 

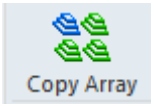
and then click the Z axis of the dynamic UCS to view the tray from above



.

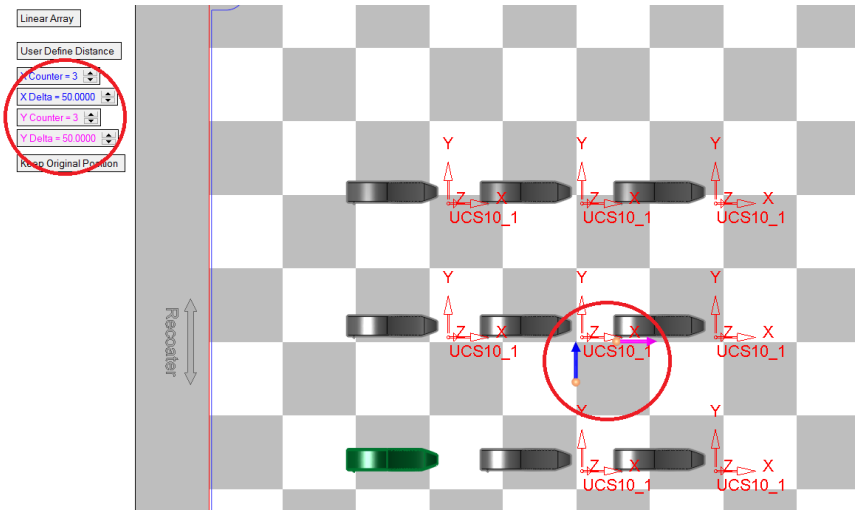
Position the part in the lower left area, right mouse click and press OK



19. Press 

and pick the part. Click the middle mouse button to move to the next step.

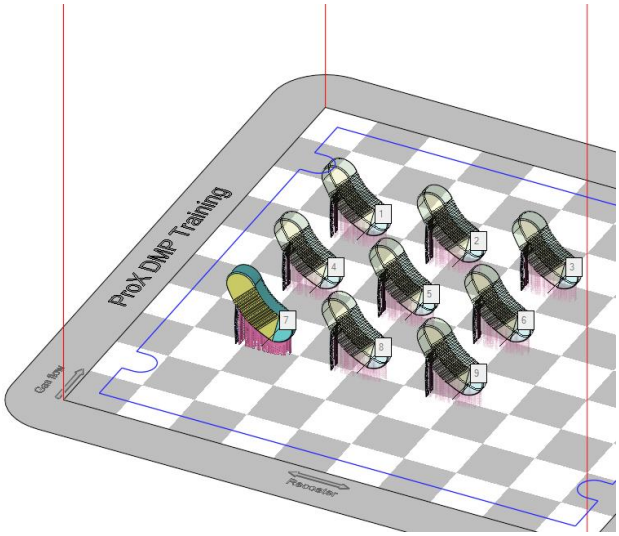
Make sure that the direction arrow point so that the part will be added around the middle of the plate and set an array of 3x3:

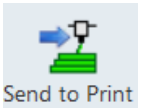


Right mouse click and press OK.

20. Click 

and set the order for printing. The image below refers to order by Against Gas Flow (Gas flow direction here is left to right).



21. Press Send to Print 

in order to create the output file (this file will be loaded on your printer) and press OK.

Appendix 1: 3DXpert file icons

As files are created and saved with 3DXpert, they all get the extension *.elt.

However, *.elt files can still have different types, depending on the specific 3DXpert application saving them. These types are represented by different icons which are attached to the file.

The following table describes the meaning of each icon.

The 3DP column describes whether the icons are set (during the save operation) by a dedicated 3D Printing application (y means 'Yes').

Icon	3DP	3DXpert *.elt File Type
		A part file created in 3DXpert or imported into 3DXpert
		The main assembly file created in 3DXpert or imported into 3DXpert*
		A drawing (2D) file created in 3DXpert or imported into 3DXpert
		A NC file created in 3DXpert
	y	The main assembly file of a 3D Printing project
	y	The Tray part (this file contains the Build Plate)
	y	A part which has been added into a 3D Printing project
	y	The main assembly file of an Operator project
	y	A sliced part which has been loaded on the Operator
		A packed file (see Appendix 2).

* The main assembly file is always associated with its part files or sub assembly files.

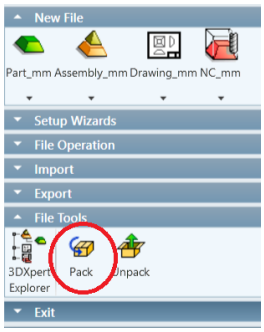
Appendix 2: Packing Files

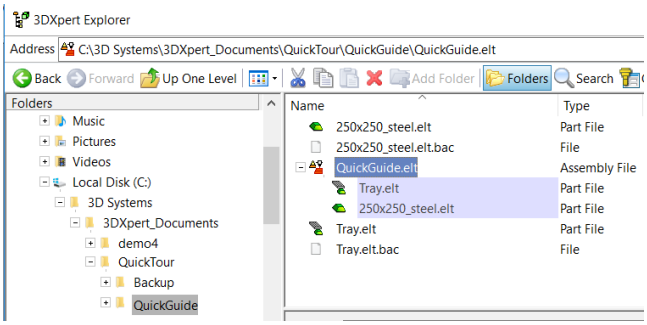
Once you have a 3Dxpert project saved on your PC, you may wish to back it up or send it to another user.

An easy way to do this is using Pack/Unpack.

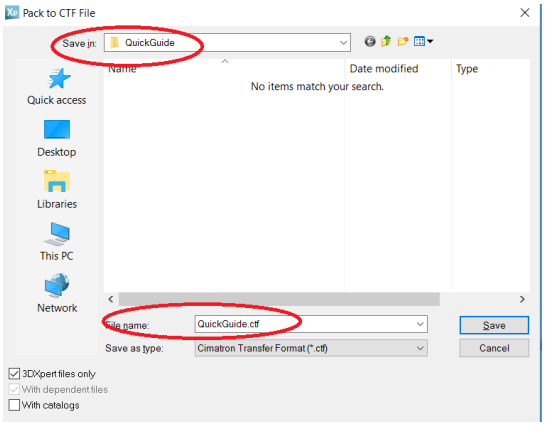
Pack creates a single file that includes the 3Dxpert elt files which are included with the project. A packed file has the extension *.ctf.

From the menu select Pack and as the browser opens up, pick the main project file (the assembly file)

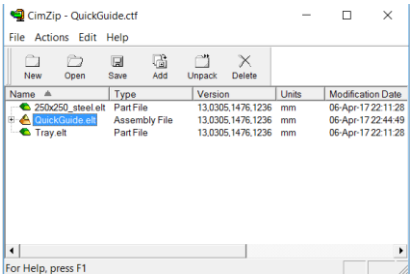




Next, set the name and location for the ctf file. Press Save.



To open a packed file either use Unpack or double click the ctf (on a PC where 3Dxpert is installed).



Pick the file to extract (unpack) from the ctf. Picking of the main project file is enough.
Note that it is possible to pack a folder with all files or add non elt files to a ctf file.