3DXpert Guide

3DXpert for Renishaw

Tutorial_V1- Updated: 15,0300,1774,989(SP3)

Table of Contents

Introduction

This document explains the advantages of 3DXpert when working with RENISHAW printers and, in addition, it is a technical guide showing how to prepare (or setup) 3DXpert for working with RENISHAW.

RENISHAW is a well-known vendor of metal printers. The RENISHAW software for 3D Printing is called QuantAM, used to hatch part data and apply the relevant laser parameters on RENISHAW printers.

QuantAM can run in the background (SDK) of the Design for Additive Manufacturing software such as 3DXpert. A QuantAM license is mandatory, in order to print on an RENISHAW printer.

3DXpert can write data to the RENISHAW DMLS machines, and since 3DXpert 15SP3, it also includes a direct interface to the QuantAM via RENISHAW's SDK.

The 3DXpert Offering for RENISHAW

1. 3DXpert is the most advanced and complete software solution for Additive Manufacturing and supports the following:
    a. Part preparation: positioning, supports, analysis, printability checks, tray management, etc.
    b. Printable lightweight and surface texture lattice structures.
    c. Integrated Build Simulation.
    d. Slicer for RENISHAW:
        i. Using RENISHAW Validated Materials (for selected printers).
        ii. Using 3DXpert Build Styles for RENISHAW.
2. 3DXpert optionally provides a solution and automation for the post processing workflow.
3. Unique offering:
    a. 3DXpert's advanced scanpath strategies and multi-strategy approach with 3D-Zoning are directly relevant for supports, and indirectly for the Part (described in detail below).
    b. Optional hatching strategies for all support types.

3DXpert and 3D Printing Formats

3DXpert can work with all types of 3D direct metal (DMLS) printers.

It can output using both **direct** and **indirect** interfaces to the different printers on the market.

The **indirect** format allows the user to export mesh data (STL type formats) or slicing data (CLI contour data) of the prepared geometry, while the **direct** format also includes the specific strategy with all hatching and laser parameter data in the machine specific format.

The **indirect** format contains the geometrical boundaries or alternatively, the slicing information for the geometry that it represents. It can also describe if the slicing motions belong to the up, down or middle facing areas of the model. This information can be used later on to define the required hatching and laser parameter values. Each printer vendor usually provides software that can load this data and then apply the hatching and laser parameters to this input.

The **direct** format includes all the relevant scanpath information, including the laser parameters, which are attached to the specific scanning motions. This output can either be an external binary file or an ASCII (text format) file that the printer or the vendor software can directly read.

<u>The Output to RENISHAW:</u>

3DXpert is fully capable of outputting the scanpath for the part and supports, including hatching, to a RENISHAW direct format – a MTT file (RENISHAW's native file format).

3DXpert calculates the slicing information for the part (contours) and QuantAM will add the sintering motions (including hatching) & laser parameters. As a result, the output file includes all the data for the printer.

In addition, 3DXpert can use the RENISHAW SDK to create the MTT file. This is applicable to RENISHAW printers that are supported by the RENISHAW SDK, and requires an active QuantAM & QuantAM Post Processor software on the same PC where 3DXpert is installed.

Regardless of the way that the MTT file has been generated, QuantAM can read the MTT file that 3DXpert writes.

This guide discusses the two methods to work with RENISHAW:

A. Using RENISHAW Validated Materials (via QuantAM SDK).
    - Output is a MTT file.
B. Using Predefined 3DXpert Build Styles for RENISHAW.
    - Output is a MTT file.

Notes on 3DXpert Licensing

To use the 3DXpert slicer for RENISHAW, a dedicated 3DXpert license for RENISHAW Printers is required.

The 3DXpert license which is supplied to RENISHAW users supports methods, either to use the QuantAM SDK (if available on the same PC) or to use the locally configured 3DXpert build styles, and to export the data directly in the RENISHAW MTT file.

A dedicated 3DXpert developer module: '3DX Parameter Control Dev.' (included in the 3DXpert Ultimate package), enables editing and saving build styles parameters.

Downloading Materials Databases

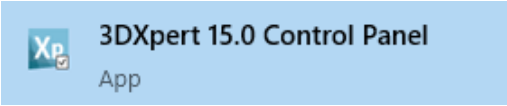
Creating a 3D Printing project in 3DXpert requires the definition of the printer and the specific material (i.e., in the case of a metal printer, the metal powder) as the mandatory first steps of the project. The printer and materials are defined by a set of files, a database, which includes the exact technology parameters for each different printer and material.

Each method requires the download of dedicated RENISHAW printer database files from the web server.

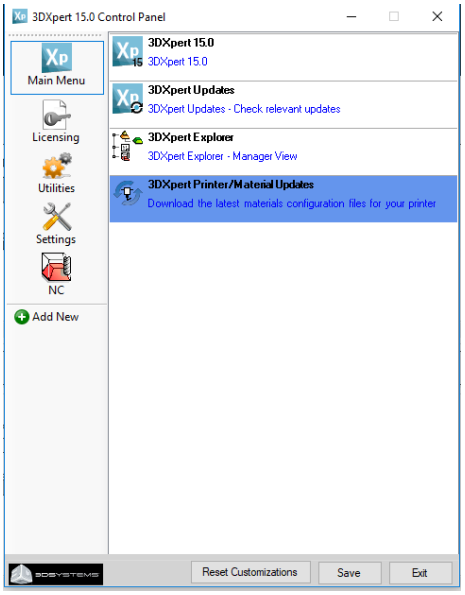
Pre-configured 3DXpert databases are available for download from the 3D Systems web server.

The following operation describes the first installation of the RENISHAW Validated Materials. This is in general a onetime operation, or until an updated RENISHAW Validated Material is released. It is also required if a customer defines a private material database via the QuantAM Material-Editor.

1. Launch the 3DXpert Control Panel.



2. From the Main Menu click the **3DXpert Printer/Material Updates**.



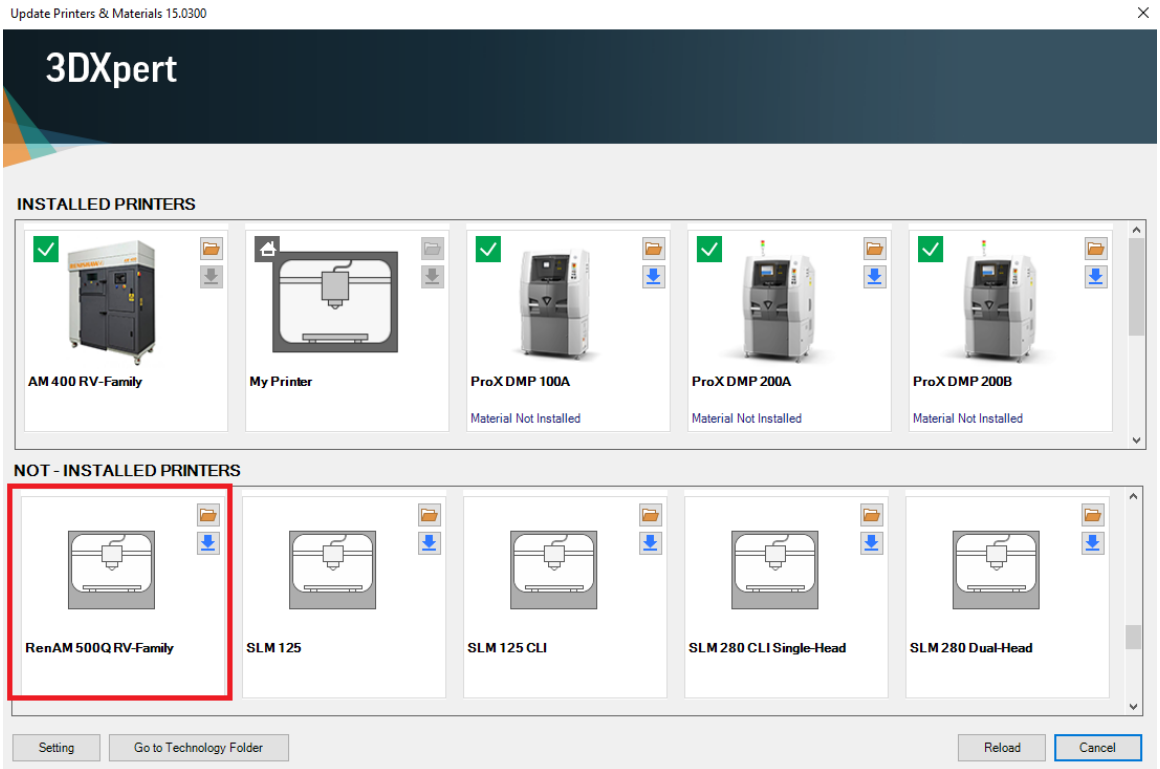
Note: if you do not have 3DXpert's license for RENISHAW printers, the RENISHAW printer database will not be visible to you.

A. Working with RENISHAW Validated Materials (via QuantAM SDK)

Download the RENISHAW Printer Family

This is relevant for the following Renishaw Printers: RenAM 500Q, RenAM 500M, AM250 and AM 400.

In the Printers Update tool, click the download button of the relevant RENISHAW printer in the NOT-INSTALLED PRINTERS section of the dialog.
An example is the one shown here **RenAM 500Q RV-Family**:



This is a 'template' that will be the source for integrating the RENISHAW Validated data with 3DXpert's material database.

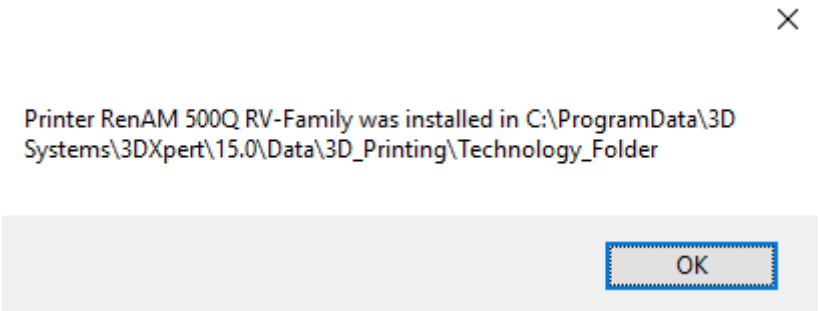
As stated above, this solution generates a MTT file, which is a RENISHAW slicing format, containing instructions for the RENISHAW printer how to sinter with the relevant laser parameters.

This allows using the RENISHAW validated material database by assigning technologies to objects in the standard 3DXpert methodology for any printer.

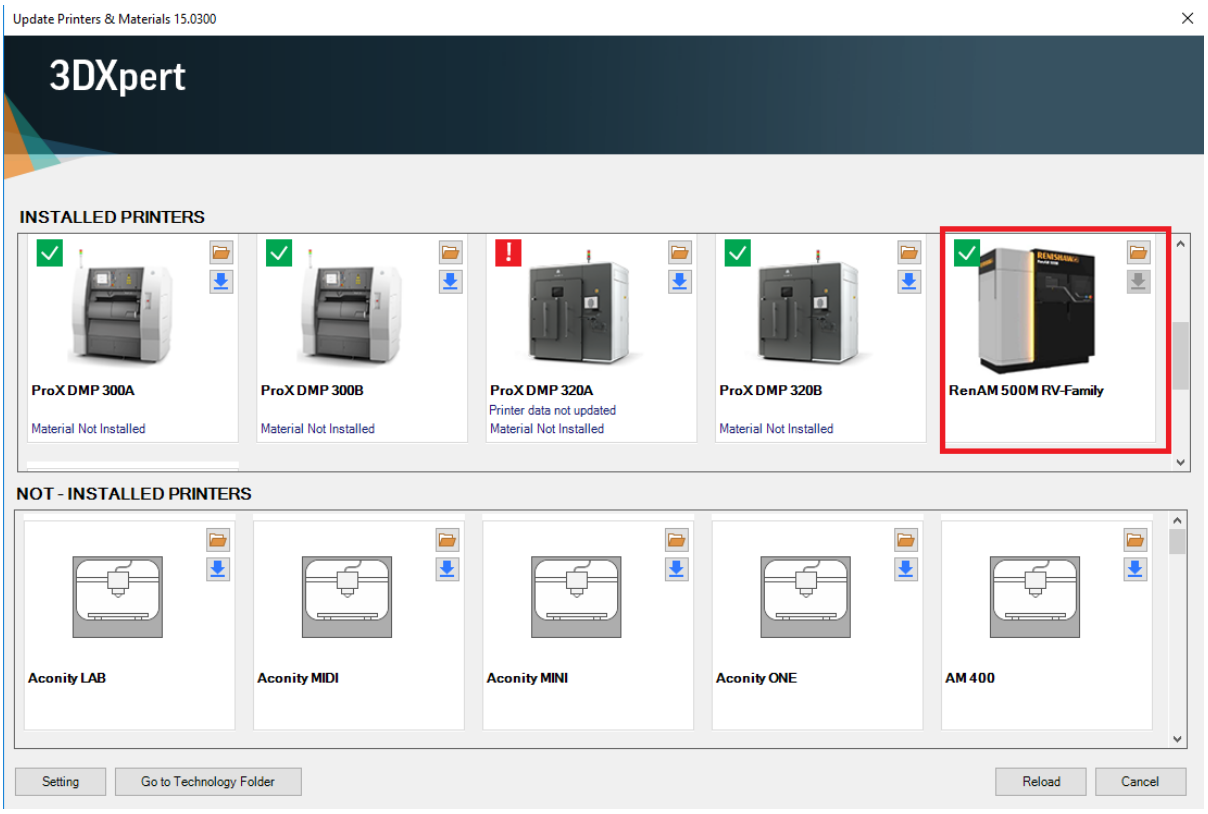
The name of the printer showing up on the Printers' update tool is the formal RENISHAW printer name (in our example, 'RenAM 500Q') plus the addition 'RV-Family', (*RV"=Renishaw Validated) which stands for the RENISHAW printer model, installed on site.

The ‘RV-Family’ postfix stands for the whole family of RenAM 500Q printers and 3DXpert generates one printer database per each printer model.

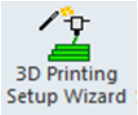
Click the Download Entire Printer Folder icon . This installs the printer on your PC.



Once installed, the printer will show up in the INSTALLED PRINTERS section of the dialog.



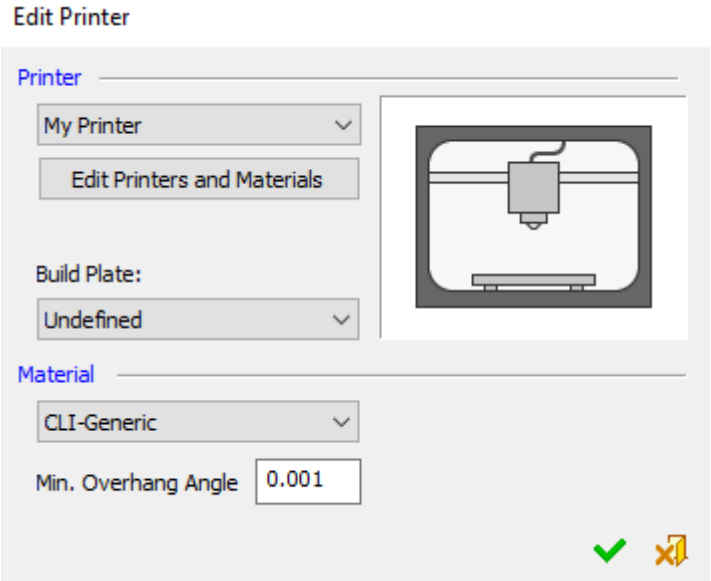
Setup of RENISHAW Validated Materials

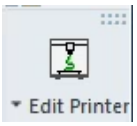


Launch 3DXpert and open/create a 3D Printing project.

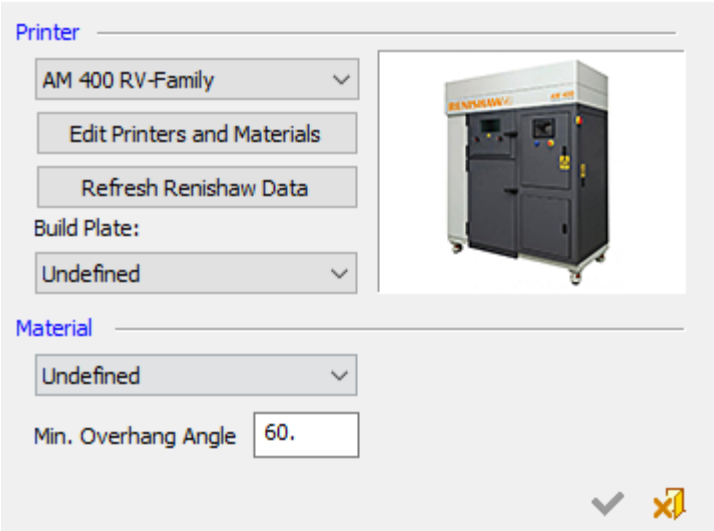
Click the Edit Printer icon from the Guide Bar

Open the Printers' list and from the dropdown select the printer called RenAM 500Q RV-Family.

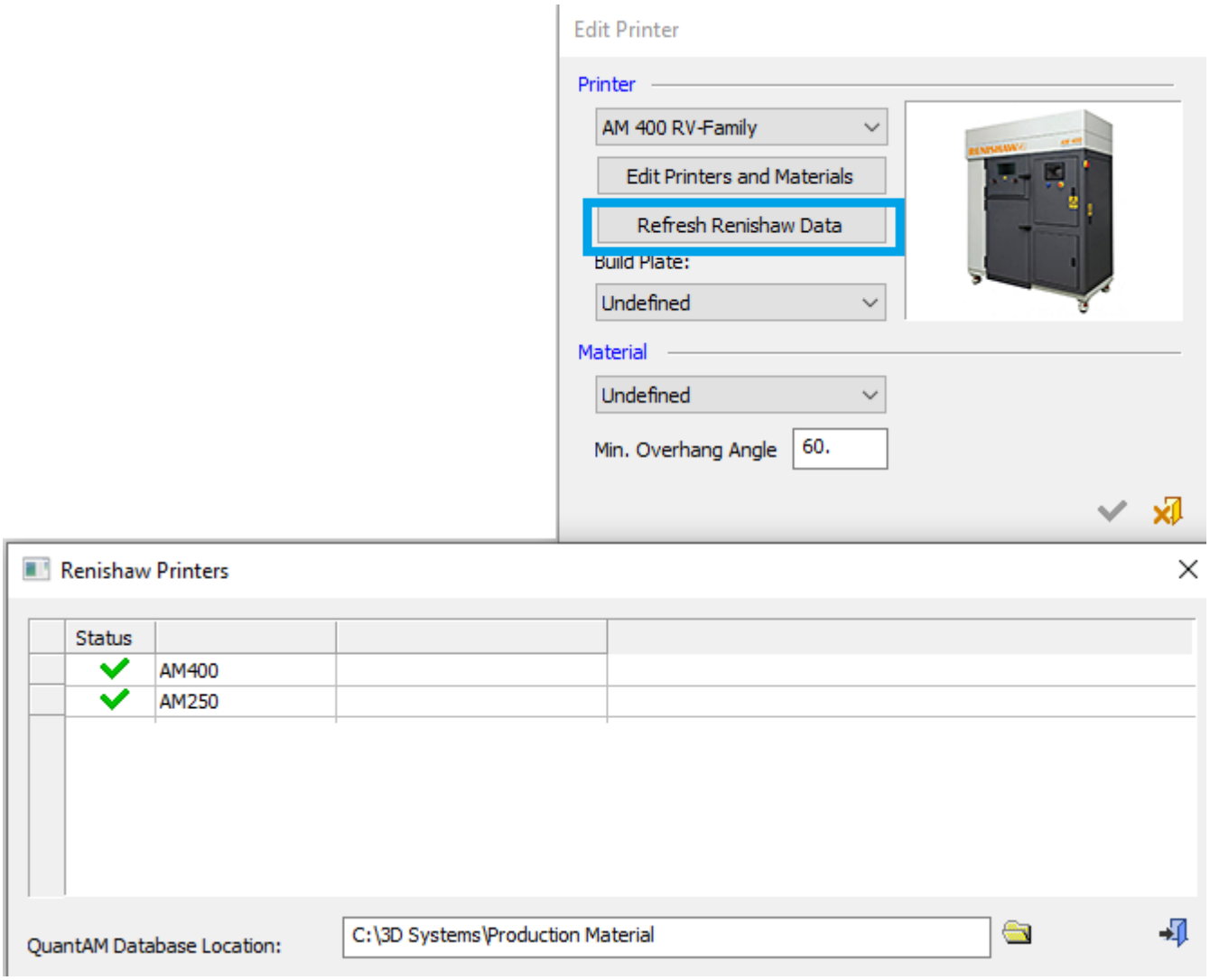




Select the RV-Family printer from the list:



Once selected, note the additional button in the Edit Printer dialog – Refresh Renishaw Data.



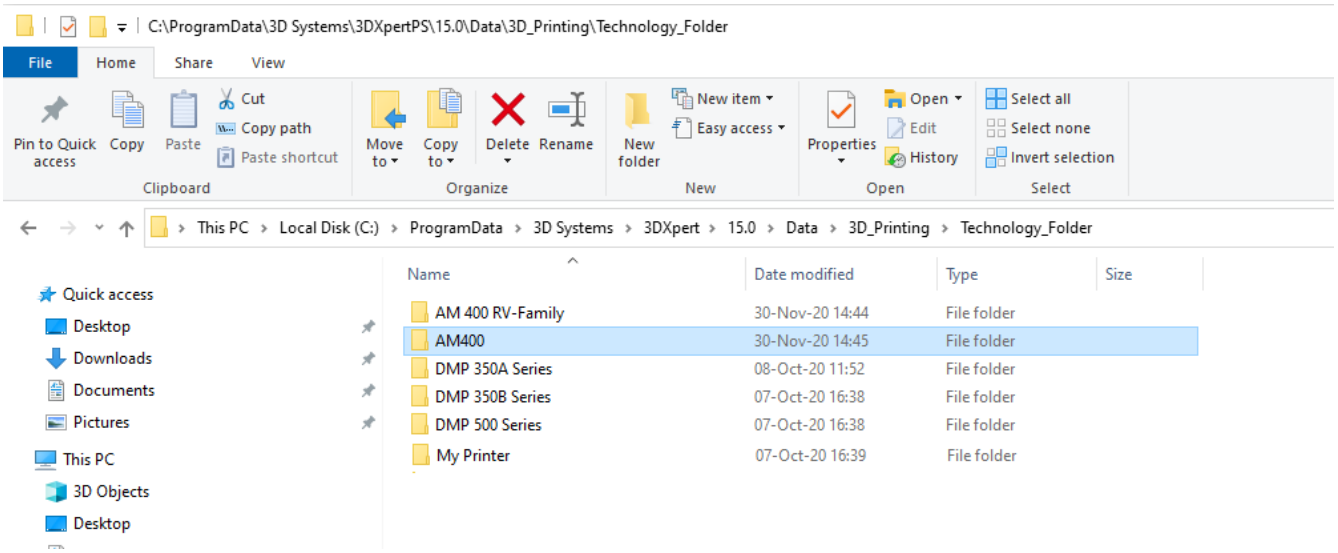
Click Refresh RENISHAW Data. At this stage, 3DXpert is communicating with the RENISHAW software (remember that an active QuantAM software on the same computer is mandatory). Set the folder name (location) where the QuantAM database is stored.

In this example table, there are two specific RENISHAW printers (sample) installed on site.

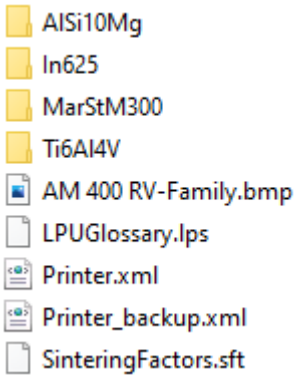
Note: As stated above, the data is retrieved from the onsite RENISHAW database. The supported RENISHAW models depend on the version of this software, so if any of your printers are not showing up in the list, contact your RENISHAW support channel.

Select a RENISHAW printer from the list and press the Close icon on the RENISHAW Printers dialog. At this point, the system creates local a 3DXpert printer database for the printer – as mentioned, 3DXpert generates one printer database per each printer model.

In this example above, if selecting AM400, at the end of this process we will find a new printer folder in our 3DXpert's Technology Folder, as shown here (AM400):



Inside this printer folder you will find the validated RENISHAW materials using official RENISHAW material names.

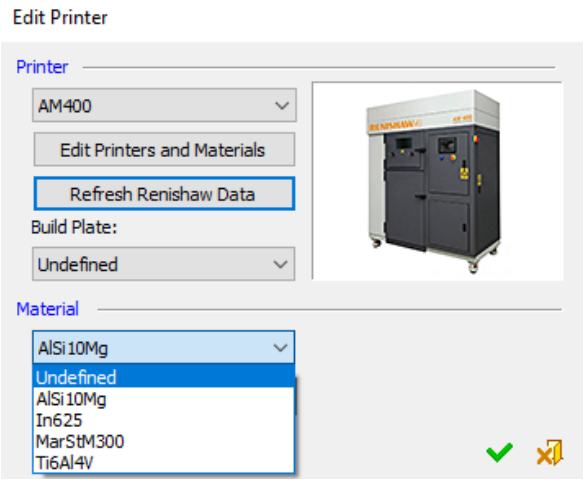


Note that the build styles folder includes the *.smp files (3DXpert file format) & *.xml (RENISHAW file format).

The printer database is almost ready. Next, from the Edit Printer dialog we will also select the material to work with.

Setting up the Technologies

Once the operation described in the previous step is over, the selected printer in the Edit Printer dialog is still the original printer. Click to open the list of available printers.
Notice the RENISHAW printer showing up in the list and select one of the RENISHAW printers. Select also the RENISHAW material to work with.
Press OK.



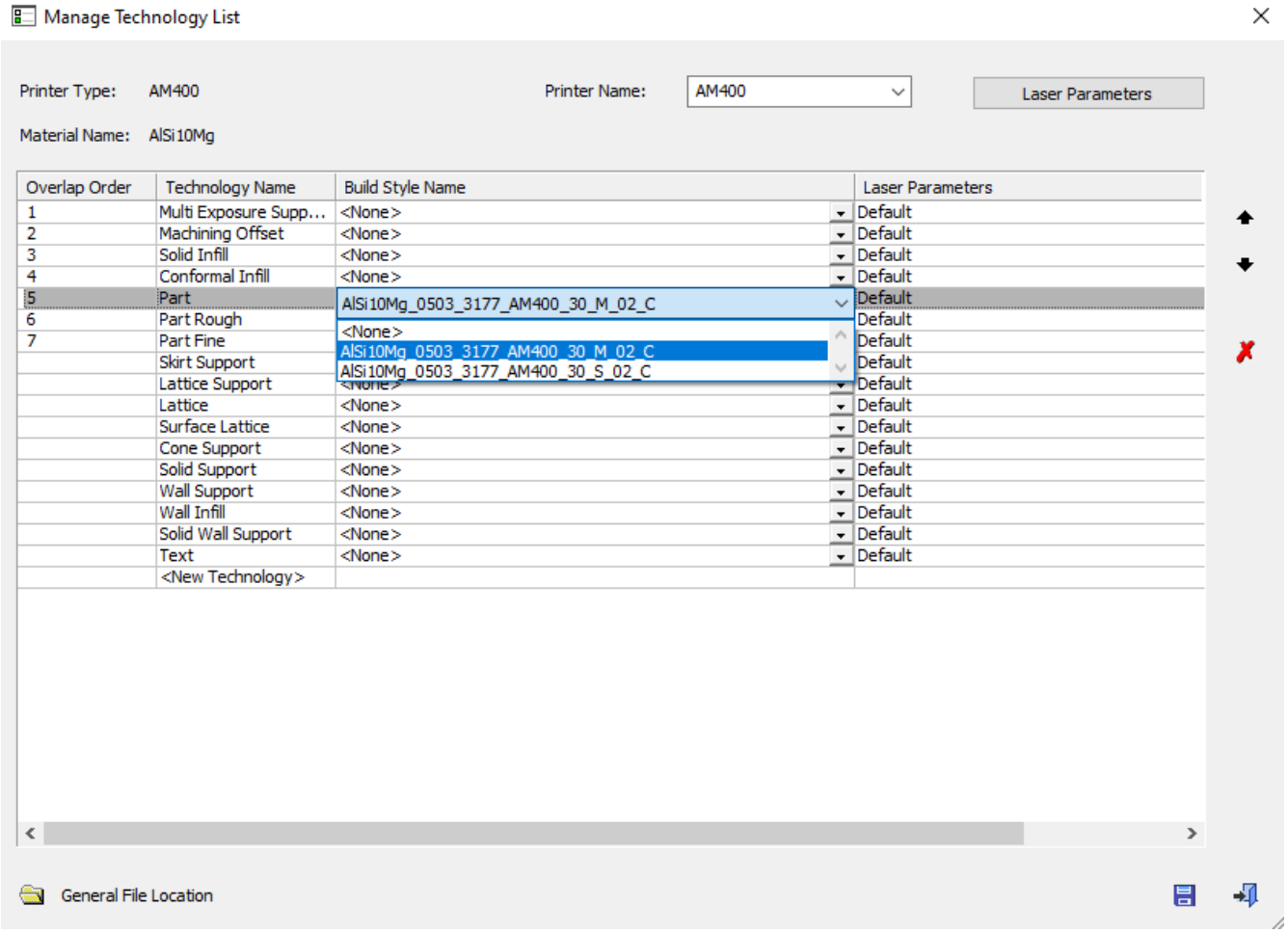
The Build plate information is retrieved from the standard 3DXpert template files, which are stored with the main 3DXpert RV-Family template. Build Plate templates can also be added to the printers' folder in the usual 3DXpert methodology.
The Refresh RENISHAW Data button remains available for each of the printer models, as whenever an RENISHAW update is released (for example, a new version of the RENISHAW validated material, printer maintenance etc…), use this button to refresh (recreate) the database also for 3DXpert.

Manage Technology List

The next step of the setup stage (usually done once) is to connect the RENISHAW technologies to the 3DXpert technology lists.
Click the Technology Settings icon.

This connection is not achieved automatically. Connect the relevant Technology Name of 3DXpert with the suitable Build Style Names coming from the specific RENISHAW Validated Material and showing up in the list (the list of available technologies may vary depending on the material).

In the Technology List of this material set the default build styles, one for the Part technology and one for the Supports technology:



Note: For each material, 2 build styles are created, one for the Part technology and one for the Supports technology. The names of the build style are almost the same, to distinguish between them use the “M” or “S” letter, as in the following example:

- Alsi10Mg_0503_3177_AM400_30_M_02_C – the letter M denotes that this build style is for the Part technology.
- Alsi10Mg_0503_3177_AM400_30_S_02_C – the letter S denotes that this build style is for the Support technology.

Also, note that the number 30 here denotes the layer thickness.

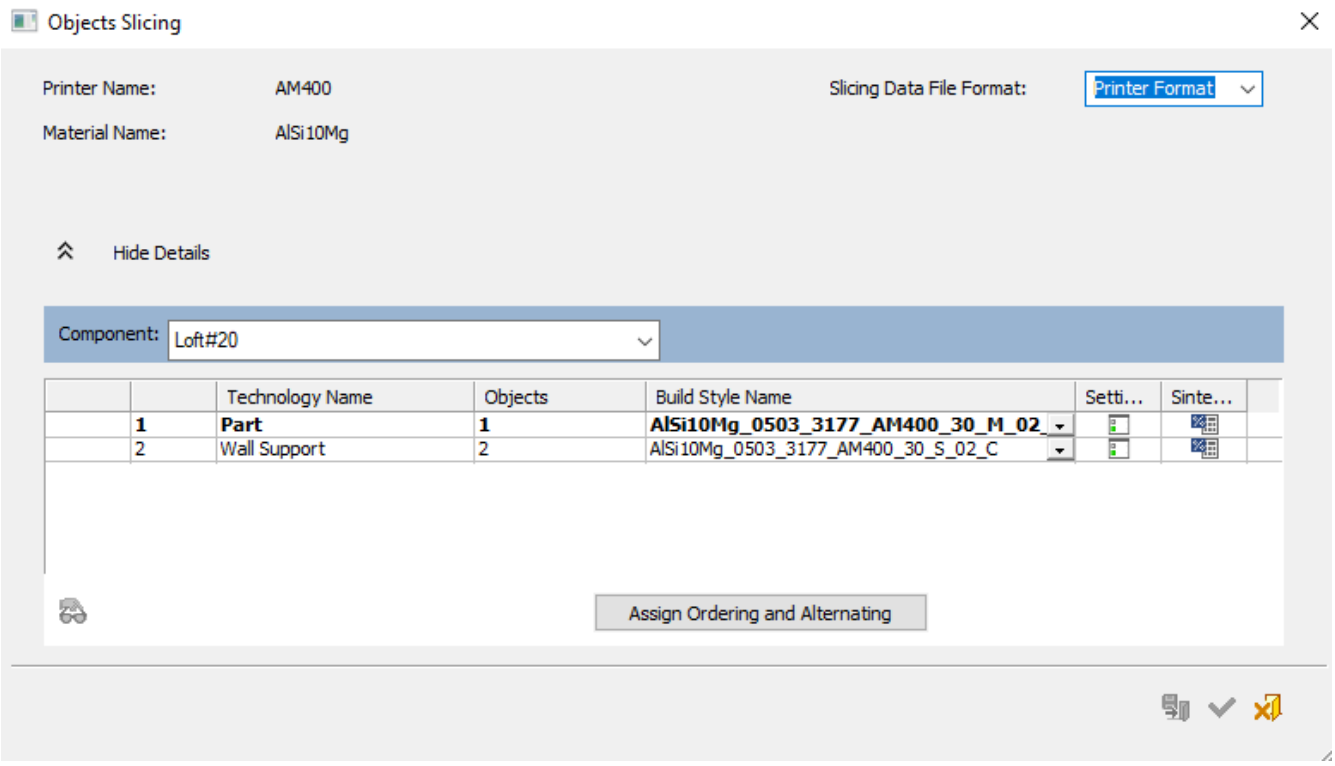
As of 3Dxpert 15, the solution does not support multi-layer thickness. A single layer thickness should be used for the part and supports technology.

Press the Save icon at the bottom of the dialog.

Now the 3DXpert material database is ready. Remember that this setup is carried out once, so from now on (or until the next material update from RENISHAW), there is no need to run any of the above again.

Slicing

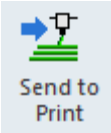
In the following example, a part with supports is sliced in 3DXpert – note the RENISHAW Build Style Names in the Object Slicing dialog:

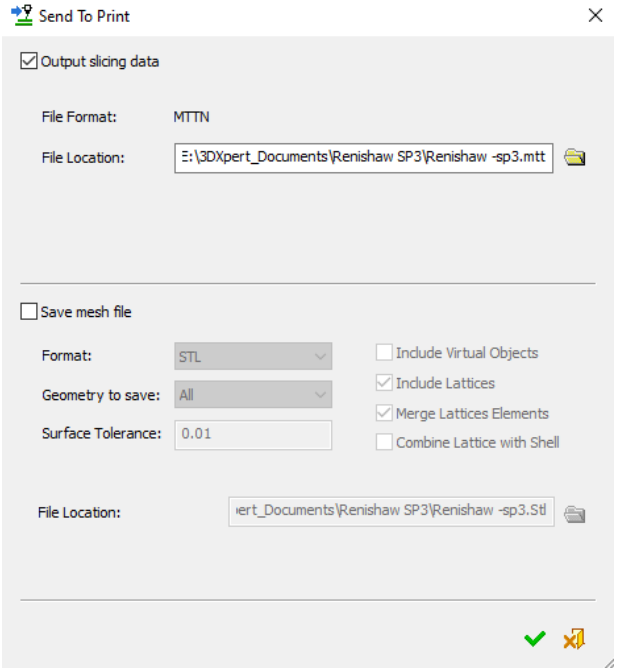


Click OK to slice the part and its supports.

Creating a MTT file

After slice calculation, press Send to Print.



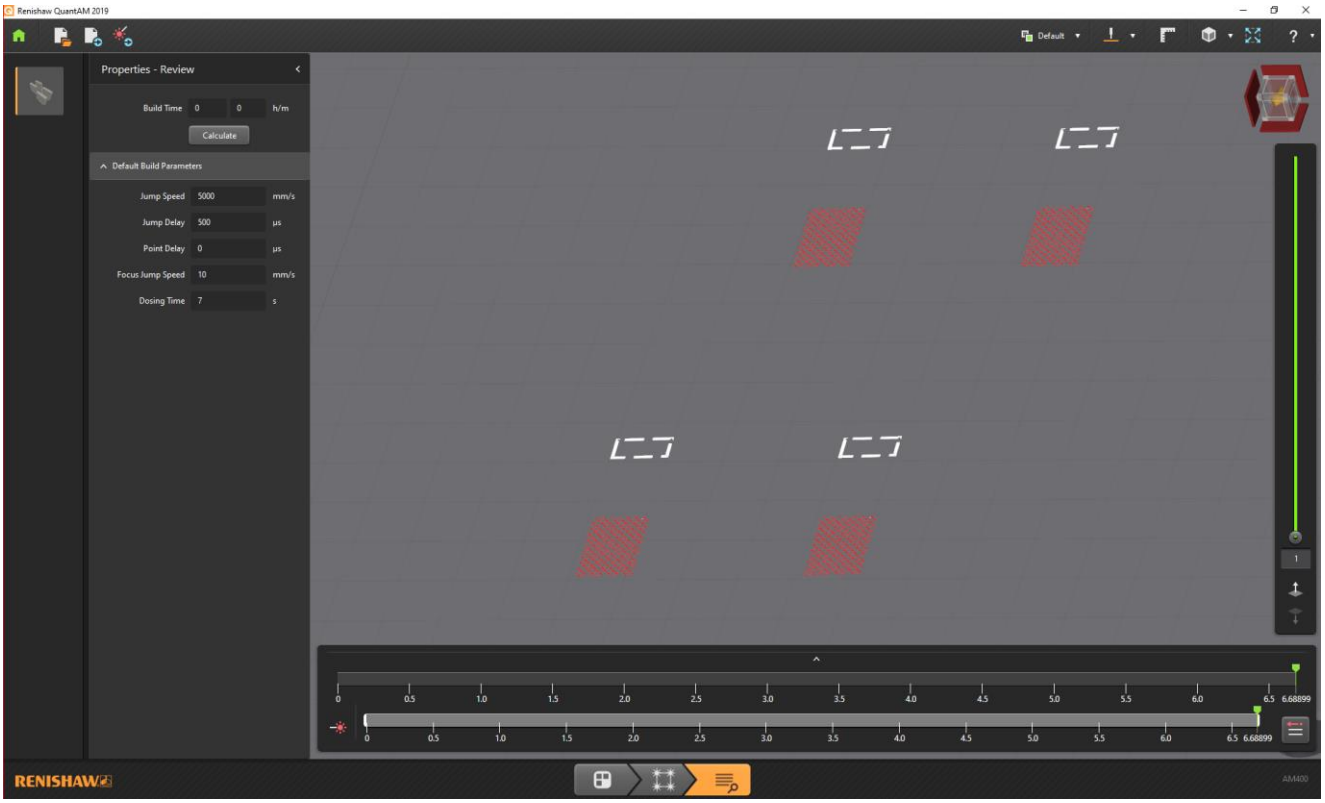


Note that on the dialog the file format is called MTTN, to distinguish this solution from the other RENISHAW solution (here the build styles were created through the RENISHAW SDK).
The output file format (extension) is MTT.

After clicking OK, look for the folder set in the File Location, as 3DXpert creates the MTT file containing all the
Information.

Load the MTT file on QuantAM.

Here you can view the scanpath layer by layer and see the scanpath paramaters.



B. Working with Predefined 3DXpert Build Styles for RENISHAW

This method is applicable if the RENISHAW printer which is in use is not supported by RENISHAW SDK, or there is no active QuantAM software on the same computer or when the user wishes to create/use 3DXpert build styles for RENISHAW.

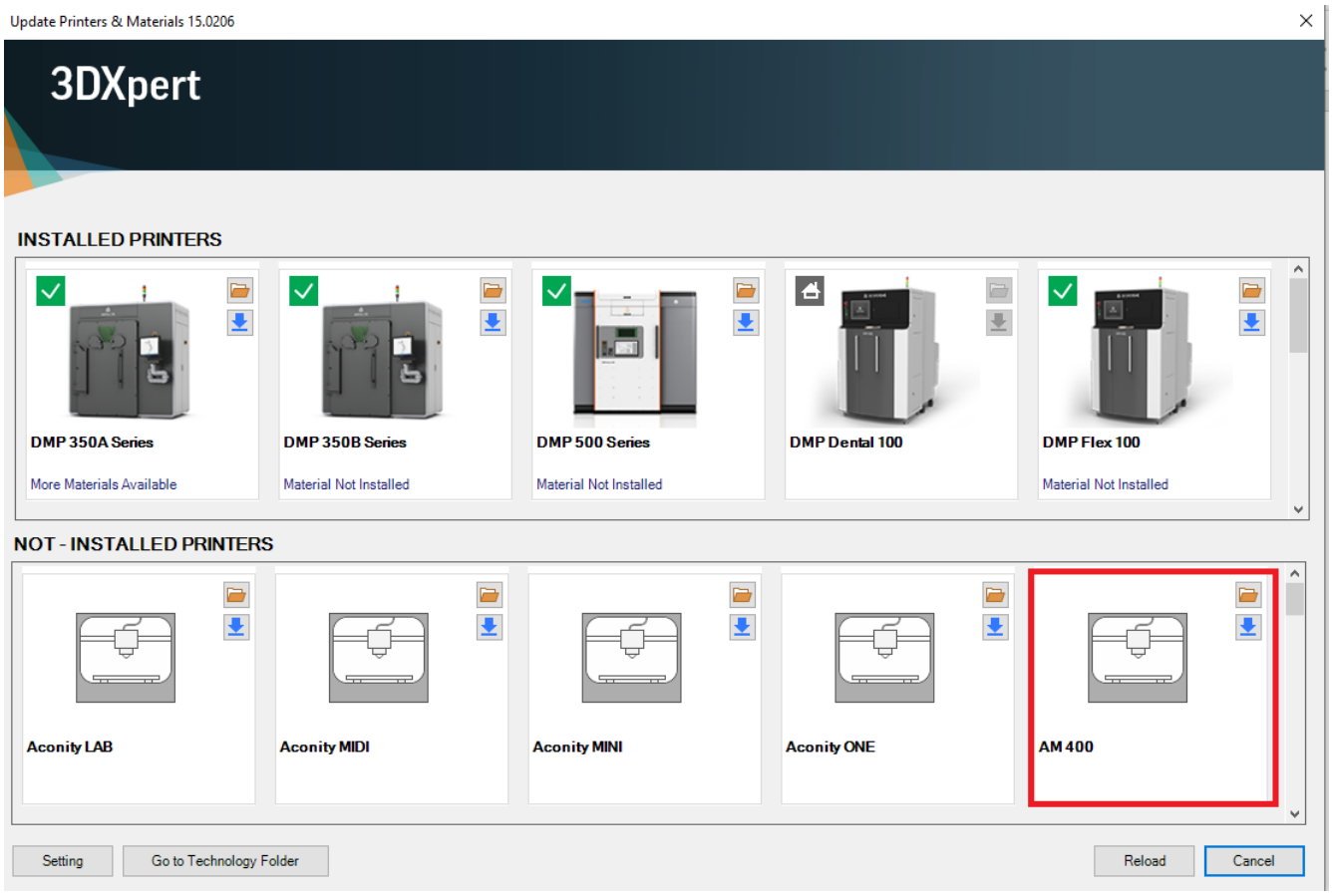
In this method, 3DXpert creates RENISHAW MTT files directly from 3DXpert build styles that include all the scanpath definitions . Material data is not retrieved from the QuantAM database.

Download the RENISHAW Printer

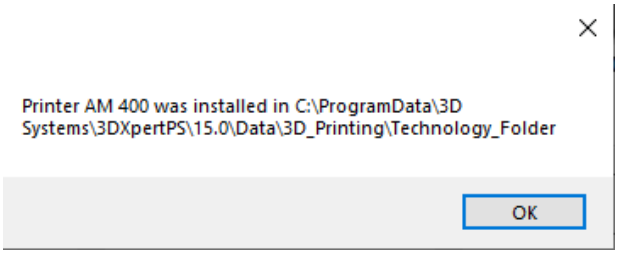
Download the printer and after that, the relevant materials for this printer.

As mentioned earlier in this document, this list displays all the printers you can download, based on your 3DXpert license.

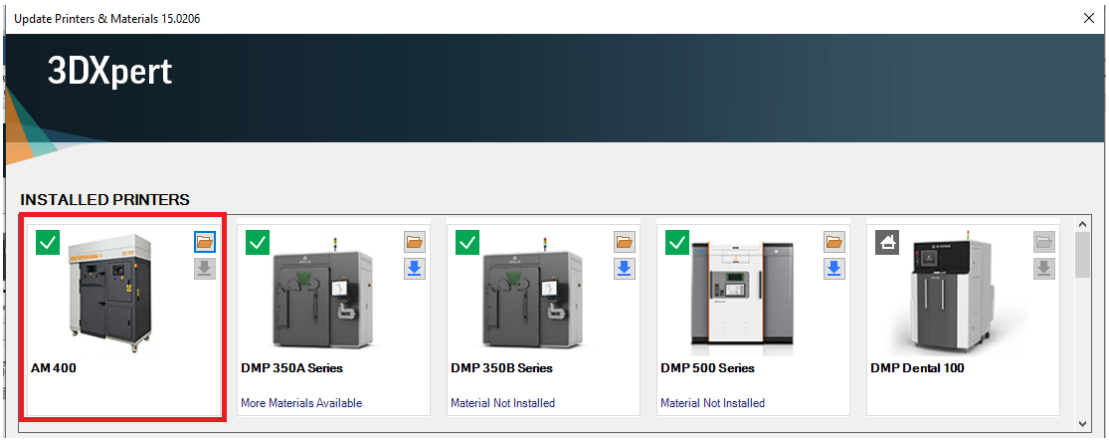
In this case, select the relevant RENISHAW printer from the list of available printers and make sure that the name of the printer will not include the RV-Family postfix. For example, let's download the AM 400 printer database:



At the end of the download, the following message will appear:

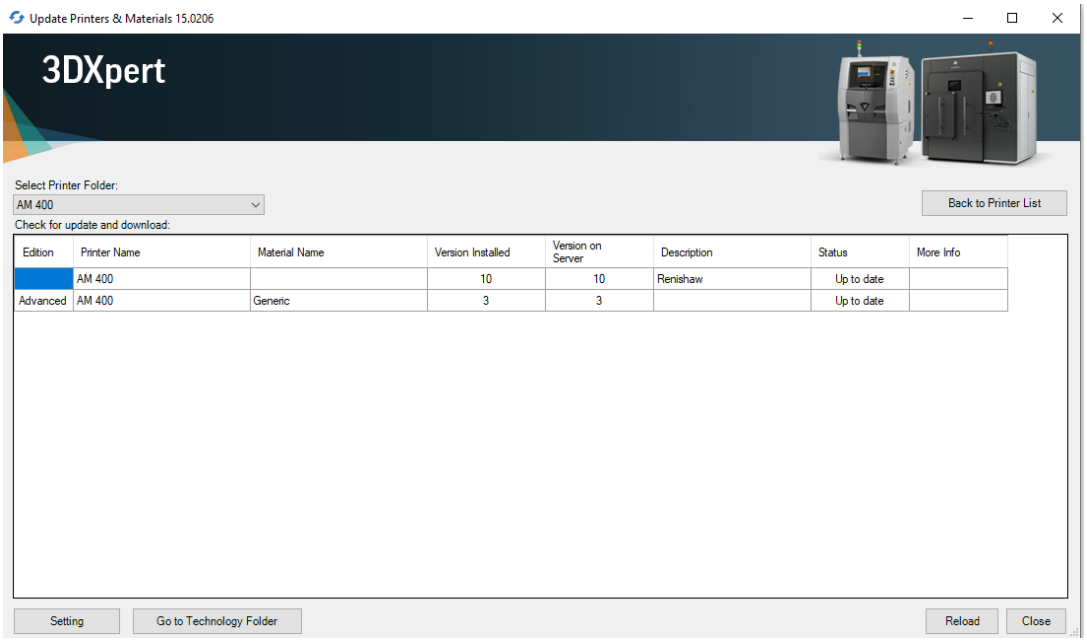


The 3DXpert printer database for the selected RENISHAW printer is now installed.



To view the materials, press the Open Printer icon 

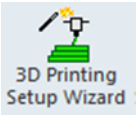
In general, if a specific material database is missing or needs an update, a **Download** button will appear alongside it.
For RENISHAW, a Generic material is available.



The default printer folder on your PC is located in the installation folder:

C:\ProgramData\3D Systems\3DXpert\<Version>\Data\3D_Printing\Technology_Folder\<Printer Name>

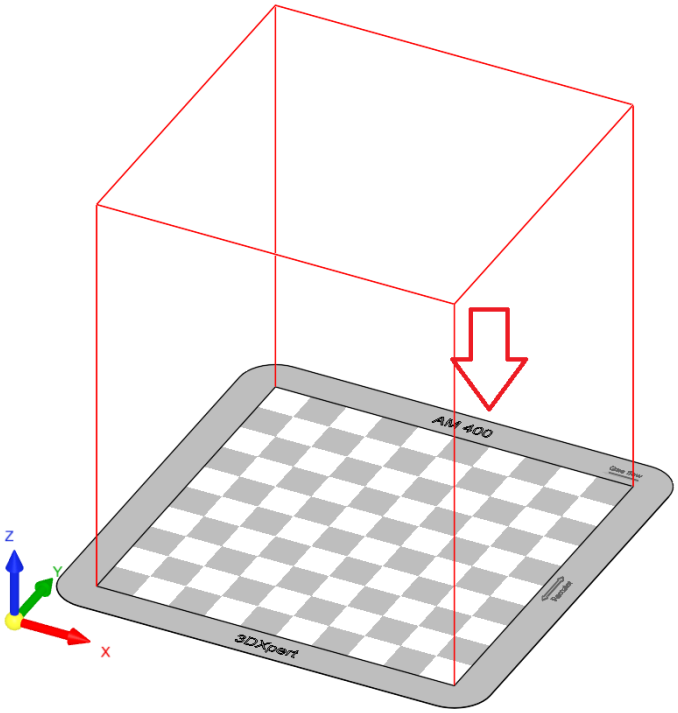
Create a new 3D Printing project.

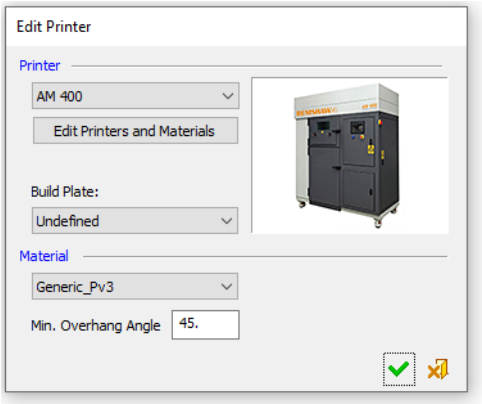


In the 3D Printing Setup Wizard, select the RENISHAW printer and material. See the image below, right.

Press OK.

3DXpert now opens up the project and creates the tray of the printer, based on the data defined in the Setup Wizard.





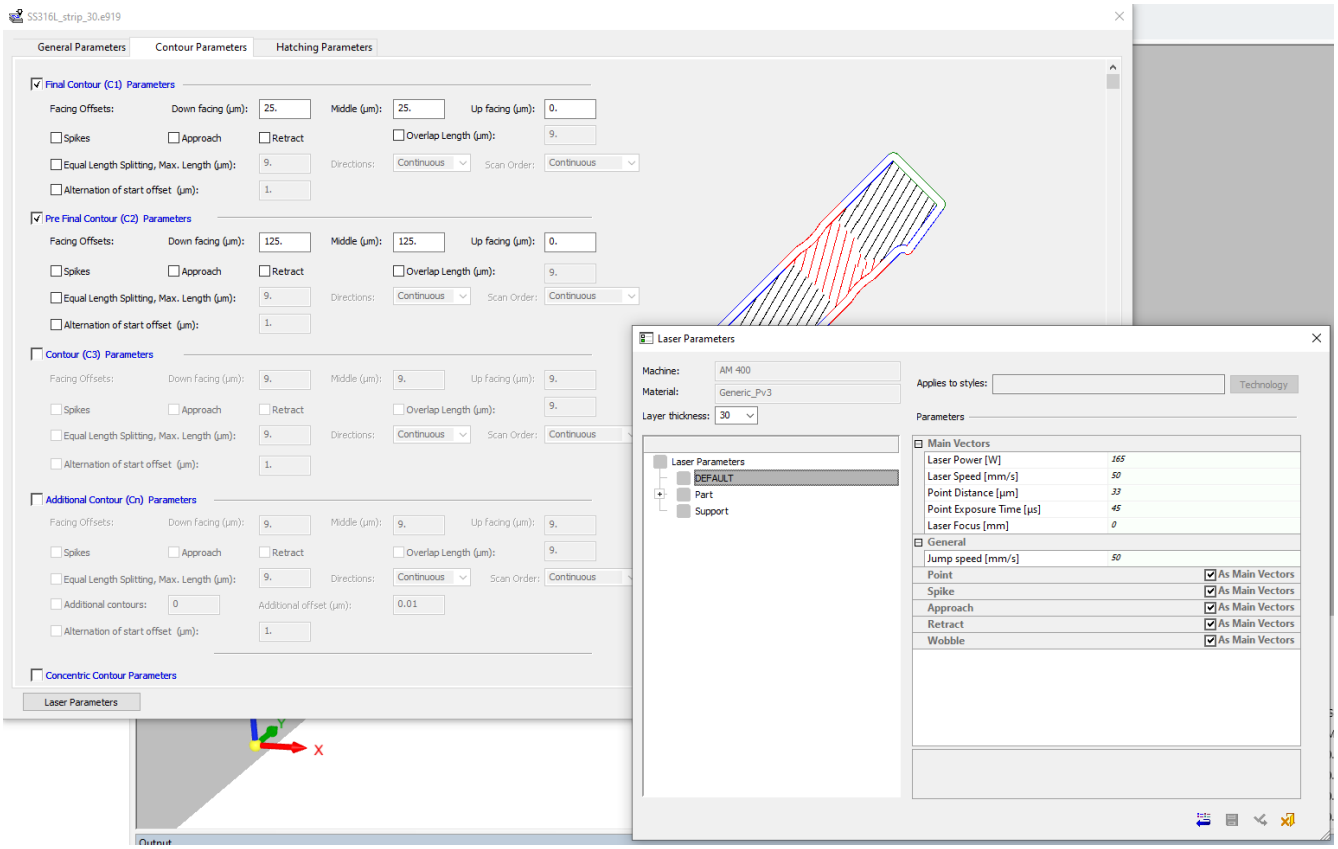
Next, load your component and prepare it for printing.
Position the part, create regions and add supports. Set the printing technologies for the part and supports.

Prepare the Material database

This can be carried out only if you have a 3DXpert Ultimate license that includes the option to create or edit 3DXpert build styles.

Click the Calculate Slices and select the Part_Generic build style. Click the icon in the Settings column to enter the build style definition dialogs (again, this is possible only with a relevant license).

Through the dialogs, input the scanpath and laser parameters for the technology. Note that this includes RENISHAW parameters for Point Distance, Point Exposure Time.



Once done, save the build style.

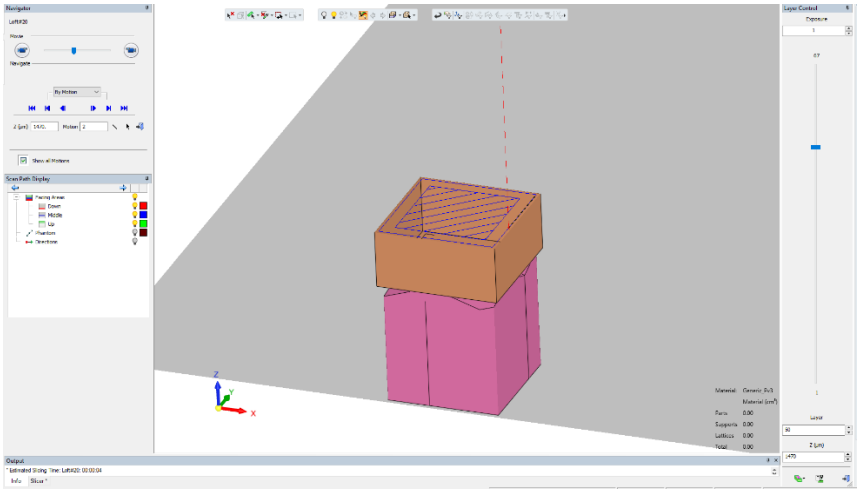
You may also need to set this build style as the default through the Technology Settings dialog (as described earlier in this guide).

In the same manner, you may need to create a second build style for the supports.

Slicing

Once the build styles ate defined, enter Calculate Slices and run the calculation for the part and its supports.

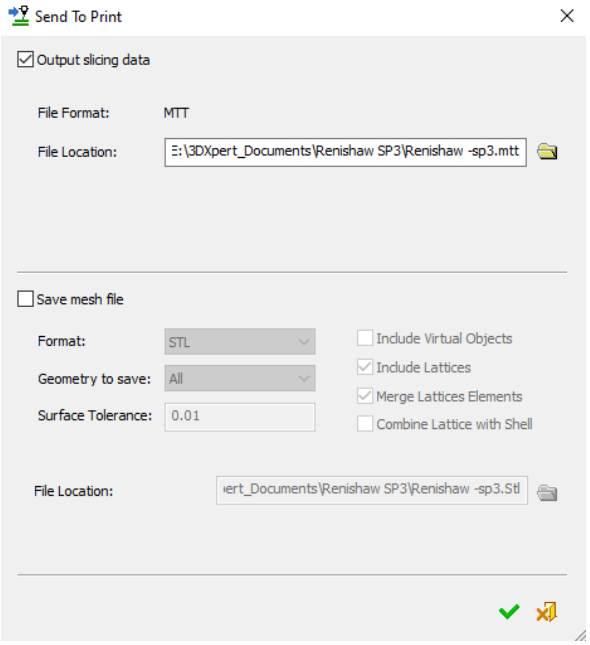
You may view the results directly on 3DXpert's Slice Viewer.



Output to RENISHAW – MTT file

After calculation is complete, you can output the data to RENISHAW. As noted above, also in this method 3DXpert creates the MTT file in the RENISHAW format.

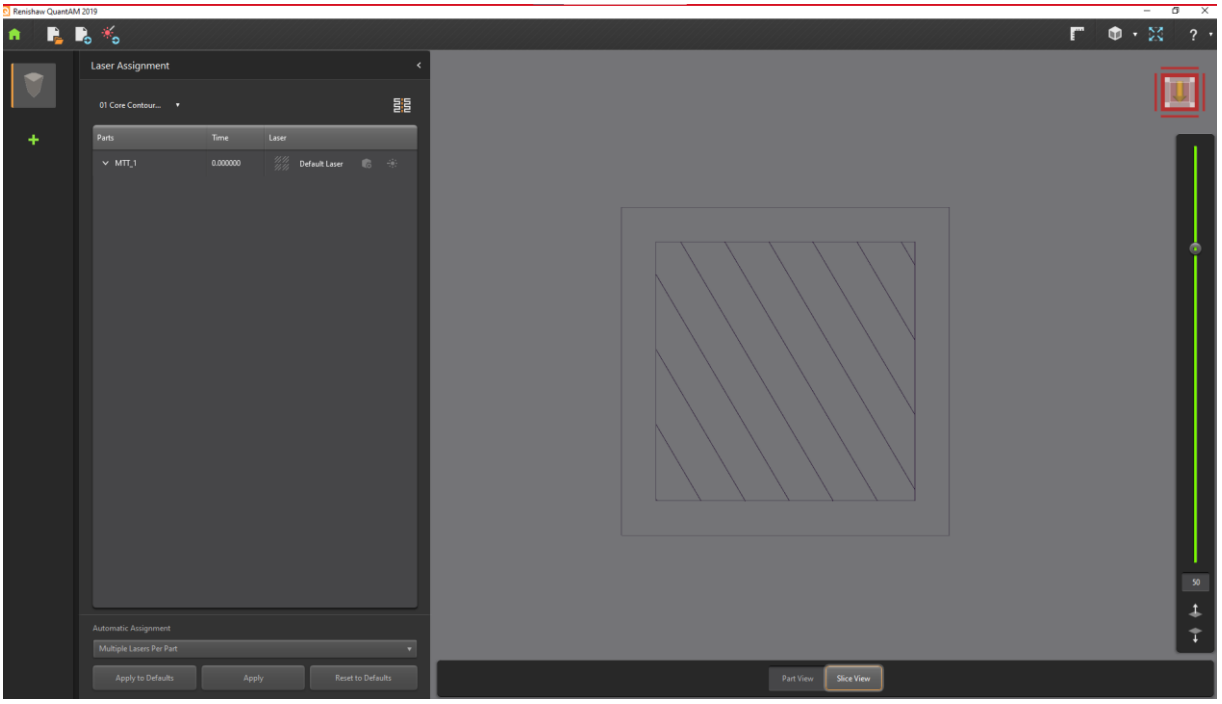
Press the **Send to Print** button and click OK.



Note that in this case, the File Format displayed on the dialog is MTT.

This creates a single MTT file with the scanpath data.

You can load this file on RENISHAW's QuantAM.



Applying 3D Zoning with RENISHAW

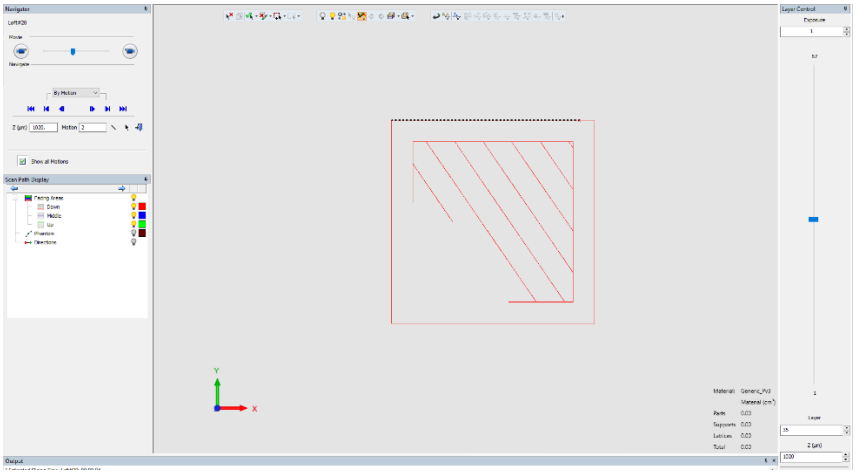
3DXpert introduces a unique '**3D Zoning**' capability. This capability allows the user to set different scanning strategies for different volumes of the part.

This enables the use of different strategies for different geometries of the part. For example, thin walls require a different strategy than a full core solid, etc. Strategies may include different laser parameters, or different hatching strategies, or even different layer thickness values (to save on machining time).

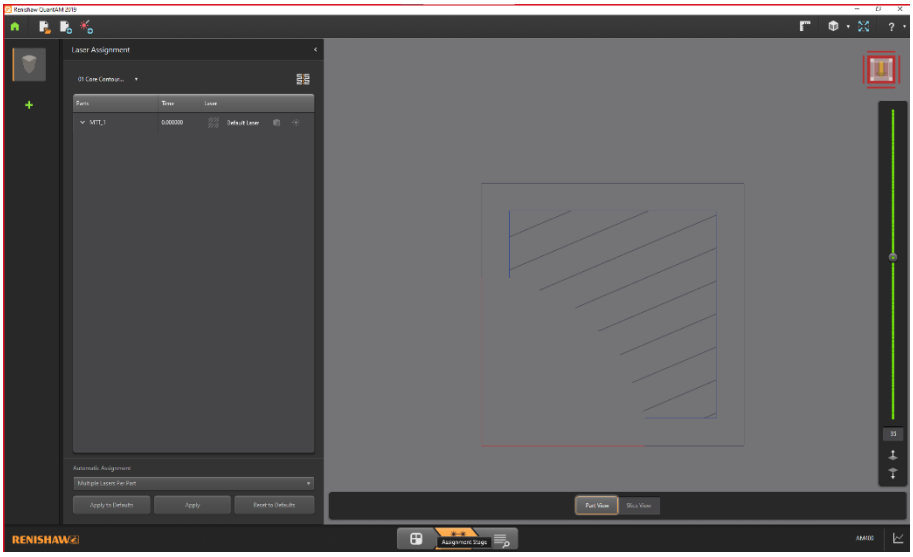
This unique feature makes 3DXpert a powerful addition to RENISHAW.

In this example a portion of the part, left lower corner, is printed with a contour only technology.

This was achieved by creating an object that overlaps with the part and setting the object as a virtual object:



After slicing and output, loading the MTT file on QuantAM shows the same scanpath as well:



For more information on 3D Zoning, refer to the 3DXpert documentation.

End of 3DXpert RENISHAW Guide.