



3DXpert

Editing Material Parameters

Tutorial_V4 - Updated: 13,0603,1489,1732(SP6P3)



Foreword:

When creating a 3D Printing project in 3DXpert, you have to specify the name of the printer on which the part will be built and the exact material (metal powder) name that will be used.

The material name is not just a name. It designates a set of files, a database, which includes the exact technology parameters (scanning parameters, laser parameters and in some printers, layering parameters). Thus, for each different material you can expect a different scan path result.

The technology parameters are set for each Technology Name (like Part, Part Rough, Solid Support, Wall Support, Lattice etc...) and layer thickness. Each set of parameters for a technology is called 'Build Style'. The complete database for a single Material is therefore composed of several Build Styles. In addition, you can define the laser parameters for each Build Style. When we describe here the saving of a material database, we actually refer to the saving of each Build Style (with own laser parameters) separately.

For each printer, 3DXpert users can download a set of materials from a dedicated 3D Systems web server. These materials come in different types (or in other words, different levels of technological setup), they are either Certified Laserform materials, Baseline materials or Empty materials.

This document serves a quick guide to editing material parameters and the related environment. It does not explain the specific scan path or laser parameters, discussed elsewhere.

It is relevant to all users that have the ability (license) to edit the materials database and it shows how to create a user material database and some implications.



1. Types of Materials

Before we explain how to edit material databases, let us first discuss the different types of materials (and again, the term 'material' here applied to the material database, the set of technological rules for each material).

First, the only materials which are validated are of **LaserForm** brand. 3D Systems certifies them to the physical properties datasheet values by using the LaserForm database. All other materials are not certified or validated by 3D Systems.

When you are working with **Certified LaserForm** materials, the following rules apply:

- 1. Some parameters are not shown (scan path and laser parameters)
- 2. The Save and Save As buttons are disabled.

For some printers, **Baseline** materials are supplied. These materials have a more basic configuration, and enable a good starting point. For example, they are supplied with CLI based formats, deploying a minimal set of parameters.

Certified Laserform and Baseline materials are software protected - users should have the matching license to run them. Also printers require a dedicated license.

Empty materials are practically...empty. Users have the freedom to configure them as they wish, but of course, the printing results should be tested thoroughly. Once saved again through 3DXpert, the materials are attached to the user's Node ID (see more on saving materials later on in this document).

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2. Editing an Empty Material Database:

We start with Empty materials, as they are open for editing. Remember that such a material database should be regarded as a clean sheet of paper. In other words, you have to define everything in it.

Create a 3D Printing Project, set the printer, and select a material of type Empty. In the 3DXpert Guide, click Calculate Slices.



Click the Settings button

Build Style Name		Settings	Sint
Part_Empty_LT-9	-	8	× III
<none></none>	-		24

This opens the slicing parameters' dialogs.

These dialogs contain all the scanning parameters, including all laser parameters, and you can edit the values to create your own material parameter set.

When done, press the Save or Save As buttons at the bottom of the dialog.



A Note on Saving Materials:

When you save a material, this material is attached to your own node ID (i.e., 3DXpert Plug ID). This material can only be used on any 3DXpert installation that is connected to the same Plug. This is done to ensure that your parameters are fully protected and cannot be read by anyone else.

If you wish to share this material with other users, either:

- Send the material back to 3DSystems to be attached also to another specific Plug ID. Note: This can be done only where the other plug ID belongs to the same customer.
- Work with a floating license. Users who work with the same license server are essentially working with the same license, which is based on the same Plug ID. Thus, any material saved on one of the PCs connected to the license server can be used by all other PCs that are also connected to the same license server.



3. Create a New Material / Edit Certified LaserForm – Copy Material:

As explained earlier, a 3DXpert material database is composed of various sets of parameters. Therefore, if you need to create a new material, it is best to use any of your existing material databases as reference, or in other words, to copy a material database and edit it. For this purpose, use the dedicated tool, Copy Material.

This tool creates an exact copy of the material, however with a different name, and this copied material still requires the same license as the original material.

Remember that Certified LaserForm materials are blocked for editing. However, if you so wish to make any change in such a material, you can use Copy Material as well (important: after editing, this will no longer be a certified material).

Creating a New material:

1. Add a New Material to the Material Library



Library

From the Tools menu, click Edit Material Library Right mouse click the left most column and click Insert Row

FEA Material	Aluminum
FF∆ Material	Berylium
Insert row	Brass
Delete row	Bronze
FEA Material	Copper - A

If you wish to use an existing material, select the cells (select the first and use Shift with the last). Right mouse click and press Copy:

	, , ,	
27 0.00185	ew Material My New Material	
0 0 0.00105	Material Berylium	
C		Cut
0 0 0.00 C	Material Brass	Сору
0 0.00 Pa	Material Bronze	Paste
J 0 0 0.00	Material Copper - Annealed	a
wn 0 0.00	Material Copper - Hard-drawn	Clear content
O O O,00 C 0 0 0,00 C C d 0 0 0,00 Pa di 0 0 0,00 C wm 0 0 0,00 C	Material Brass Material Bronze Material Copper - Annealed Material Copper - Hard-drawn	Copy Paste Clear content

Right mouse click the new row and select Paste.

Double click the cells you wish to edit (like the Material Name)

My New Material	My New Material
FEA Material	Berylium
FEA Material	Berylium
EEA Mistorial	Droop

Or, if you wish to create your own materials:

Enter the Name of the material and the rest of the data

FEA Material	Aluminum	
My New Material	My New Material	
FEA Material	Berylium	



Move from one field to another by Tab.

You can also copy a value from any other cell in the table and paste it to the new cell.

260	27	0
500	EE.	Cut
360	22	-
560	55	Сору
200	0	Paste
200	0	<u>.</u>
	-	Clear content

When done press the Save icon

Selection	ct Catalog Item		_
👋 🤔	🚰 Secondary	Add List Values	%))
Group	5	Name	

Close the tool.



2. From the 3DPrinting-Printing Tools menu, launch the Technology Settings tool:

3DPrinting Assembly T	ools Analysis	Window		
▼ Environment				
 Component Operati 	ons			
 Analysis Tools 				
 Supports 				
 Printing tools 				
Assign Technology Settings	y Machining Offset			
Create Lattice FEA	Lattice	Infill Pattern	yesser Surface	

Press the 'Copy to New Material' button at the bottom of the dialog:

Manage Teo	hnology List				
rinter Type:	ProX DMP 300B	Printer Name:	ProX DMP 300B	Laser Pa	rameters
aterial Name:	LaserForm 17-4PH (B)_S	75 Default Min. O	Verhang Angle : 30).	
Overlap Order	Technology Name	Build Style Name		Laser Parameters	^
1	Multi Exposure Supp	<none></none>		Default	
2	Machining Offset	Part_17-4PH_LT-40		Part	
3	Part	Part 17-4PH LT-40		Part	
4	Part Rough	Part Rough_17-4PH_LT-40		Heart	
5	Part Fine	<none></none>		Default	
5	Part Shell&Heart	Part Shell&Heart 17-4PH LT-40		Part Shell&Heart	
7	Solid Infill	Solid Infil 17-4PH LT-40		Heart	
8	Conformal Infil	Solid Infil 17-4PH_LT-40		Heart	
	Lattice	Lattice 17-4PH LT-40		Part	
	Blade Support	Blade Support 17-4PH LT-40		Blade Support	
	Skirt Support	Solid Support_17-4PH_LT-40		Heart	
	Lattice Support	Lattice 17-4PH LT-40		Part	
	Surface Lattice	<none></none>		Default	
	Cone Support	Solid Support 17-4PH LT-40		Heart	
	a tha in t	a Flatin Craine Crains		h	
					,
General Fil	e Location	Copy to New N	1aterial		R

The Materials Library is launched – choose the new material just created and press the OK button.

Metal Powder	Ti6Al4VGrade5	Titanium Ti6AI4V	0	0	0		
Metal Powder	TiCPGrade1	Titanium CP1 (Gr	0	0	0		
Metal Powder	TiCPGrade2	Titanium CP1 (Gr	0	0	0		
Metal Powder	Tungsten		0	0	0		
Metal Powdor	Unspecified		0	0	0		
My New Material	My New Material		0	27	0.00185		
Non Alloy Steel	AISI 1055	Annealed	220	29	0		
Norr-Ru, Charl	WERKSTOFF 1.1203	Annealed	220	0	0		
Stainless steel and cast steel	WERKSTOFF 1.4546	Martenstic	240	23	0		
Tekis_Material	1050,1730,CK45,St37,St42,St52		0	0	0	~	
<					>		イト
							\sim

This creates a new material folder, which is located under the same printer folder.

Exit the Technology Settings tool.



NOTE:			
The default printer folder	on your PC is located in the	e installation folder:	
C:\ProgramData\3D Systems	s\3DXpert\13.0\Data\3D_Prin	iting\Technology_Folder\ <printer nan<="" td=""><td>ne></td></printer>	ne>
You can set a different fol General File Location but	lder (this can also be a shar ton and browse to the folde Wall Intil	ed folder on the network) by clicki er you wish to designate.	ng the
	Solid Wall Support	Solid Wall Support 17-4PH LT-40	
	Text	Part_17-4PH_LT-40	
	•		
	🔄 General File Location	Copy to New Material	

Select the Edit Printer button on the Guide and from the list select the new material you have created.

Edit Printer	
Printer	
ProX DMP 300B	
Edit Printer Parameters	
Build Plate:	
Undefined \lor	
Material	
My New Material ∨	
Min. Overhang Angle 30.]
	🗸 🖌

Through the 3DPrinting Guide, enter Calculate Slicing and click Settings.

Notice that:

1. Some of the parameters are still hidden (this material was copied from a Certified LaserForm material).

2. The Save and Save As buttons are enabled. You can edit the visible parameters and save them with this material.

And remember:

A scan path calculated with such material will no longer be of Certified LaserForm brand.



4. Editing Materials' Parameters through the Scan Path Manager:

Once you calculate a scan path, it is kept in the file. You can view and review the result using the Slice Viewer, but if you wish to review also the slicing parameters or go through the calculation history, enter the Scan Path Manager.

Select a Certified LaserForm material and calculate it. From the Guide select Scan-Path Manager.



Notice that since you have used a Certified LaserForm material, this calculated scan path is designated accordingly. See image below (Material Brand).

Sca	an-Path Manager			×				
Status	Scan-Path ID	Scan-Path Name	Comment					
Param	Recalculate Slices	Slice Viewe calculate Slices Value	r 💽 Show Slicer Log 📸 Send To Print	Print Estimation				
Printer	r Name	ProX DMP 300B	ProX DMP 300B					
Materi	al Name	LaserForm 17-4	laserForm 17-4PH (B) Sv5					
Materi	al Brand	3DSystems Vali	3DSystems Validated Material					
Slicing	Date and Time	14-07-2017 00	14-07-2017 00:02:47					
Slicer	Version	13,0400,1485,1	13.0400.1485.1383					
	Technology Name	Objects	Build Style Name					
1	Part	1	Part_17-4PH_LT-40					
2	Wall Support	491	Wall Support_17-4PH_LT-80					
,				_				

With the Scan Path Manager you can review any of the scan paths saved within the file.

Click Recalculate Slices.

The dialog that shows up resembles the dialog as in Calculate Slices.

However, note the ## signs before and after the Build Style names. This means you are looking at the parameters of the scan path calculated and saved within this specific file (and not the parameters of the material database that is kept as default with your 3DXpert installation).

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Click the Setting button.

🔳 Ob	jects Slicing						
Printer	ProX [OMP 300B		Slicin	ig Data F	ile	Printer Format
Material	LaserF	Form 17-4PH					
	Technology Name	Objects	👝 d Style Name		Setti	Sint	
1	Part	1	##Fart_17-4PH_LT-4D##	-	=	×.	
2	Wall Support	491	##Wall Support_17-4NU_LT-80##	-		2	
					分	•	

Notice that:

1. Since you are looking at the parameters of a Certified LaserForm material, some parameters are hidden. (NOTE: When working with Baseline or Empty materials, all the parameters are available.)

2. The Save button is available.

Edit some parameters, press the Save button and the Ok button for File Protection.

This means that you can edit parameters and recalculate the scan path. This will only change the parameters within this specific file.

However, doing this has an important implication: As you have changed parameters of a Certified LaserForm material, this new calculated Scan-Path will no longer be Certified.

Notice that after recalculation, the Scan Path's Material Brand attribute is now empty.

Sc.	an-Path Manager			×				
Statu	IS Scan-Path ID 2 3	Scan-Path Name	Comment					
Para	Recalculate Slices	Ø↓ Slice Viewe Value	r 🕼 Show Slicer Log 📲 Send To Print	Print Estimation				
Com	ponent Name	Teil	Teil					
Printe	er Name	ProX DMP 300B	ProX DMP 300B					
Mate	rial Name	LaserForm 17-4	LaserForm 17-4PH (B)_Sv5					
Mate	rial Brand		<]					
Slicin	g Date and Time	14-07-2017 00	:15:39					
Slice	r Version	13,0400,1485,1	383					
	Technology Name	Objects	Build Style Name					
1	Part	1	Part_17-4PH_LT-40					
2	Wall Support	491	Wall Support_17-4PH_LT-80					
				_ 1 .				

This image shows a Non-Certified scan path (see Material Brand)



5. Laser Parameters

The material database includes also the laser parameters database for specific combinations of Machine, Material and Layer Thickness.

When starting with a generic or an empty buildstyle, all laser parameters are visible, and the values are all set as a default '0'.

Laser Parameters			×
Machine: ProX DMP 100A Material: Empty_Sv1	Applies to styles:	Technology	1
Layer thickness: 9 V	Parameters		
	Main Vectors		^
Laser Parameters	Laser Power [%]	0	
DEFAULT	Mark Speed [mm/s]	0	
	Defocusing [mm/10]	0	
	Non collinear start compensation [µm]	0	
	Non collinear stop compensation [µm]	0	
	Collinear start compensation [µm]	0	
	Collinear stop compensation [µm]	0	
	General		
	Laser OFF delay [µs]	0	
	Laser ON delay [µs]	0	
	Mark delay [µs]	0	
	Jump delay [µs]	0	
	Jump speed [mm/s]	0	
	Point	As Main Vectors	
	Spike	As Main Vectors	
	Approach	As Main Vectors	
	Retract	As Main Vectors	
	Wobble	As Main Vectors	¥
		₩ 🖬 🍕 >	8

When working with Certified LaserForm materials, some parameters are protected and therefore, not shown.

E Laser Parameters			×
Machine: ProX DMP 3208 Material: LaserForm 316L (A)_Sv6	Applies to styles:	Technology	
Layer thickness: 30 v	Parameters		
	Main Vectors		
Laser Parameters	Laser Power [W]	85	
E DEFAULT	Mark Speed [mm/s]	450	
+ Lattice	Spike	As Main Vectors	
+ Solid support	Approach	As Main Vectors	
- Text	Retract	As Main Vectors	
		🛱 🖶 🤟 🙀	



If you copy validated material as a new material, the parameters are visible, and their values ate set as '0' as well.

A note for 3D Systems ProX DMP 100/200/300 printers:

When working with any of these printers, the values are also set a default as '0', as can be seen in the following image:

📒 Laser Param	neters				×
Machine: Material:	ProX DMP 2008 LaserForm 316L (B)_Sv5		Applies to styles:	Technology	
			Main Vectors		
Laser Par	ameters	_	Laser Power [%]	0	
DEF	AULT		Mark Speed [mm/s]	0	
Blac	le Support		Defocusing [mm/10]	0	
Wal	t Infill				

However, the data is driven by internal formulas so that the system converts automatically these '0' values to real values, which are written into the output file (*. FAB3).

Therefore, a value of '0' in anyone of the laser parameters means that it will get an automatic value.

In case that the user changes the value to a different value, this value will be written in the output (*.FAB3) file.



6. Adjusting Sintering Factors

The previous sections of this document discuss editing of a material database and setting the values of the specific parameters.

For example, this enables control over each and every offset value – you can set the contour offset for any type of contour for the different areas (Up, Middle or Down Facing areas) as well as the offset for the hatching in each area (all these offsets are independent).

Access the buildstyle:

Objects Slicing	1			×
Printer Name: Material Name: À Hide De	ProX DMP 300B LaserForm 316L (B)_Sv6	Sking Data File Format:	Printer Format V
Component:	bo-blank Technology Name Part	Objects 1	Build Style Name Part_316L_LT-40	Setti Sinte
₽			Assign Ordering and Alternating	Su 🗸 XI

Setting for the individual Contour Offsets:

		, internet of the second se					
Final Contour (C1) Pa	Down facing (um):	9. Middle (um):	9. Up faci	ing (µm): 9.		_	
Spikes	Approach	Retract					
🗌 Overlap Length (µ	m): ^{9.}	Splitting Length (um):	9.				
✓ Pre Final Contour (C2)	Parameters				/		
Facing Offsets:	Down facing (um):	9. Middle (um):	Up fad	ng (um): 9.			
Spikes	Approach	Retract					
🗌 Overlap Length (j.	im): ^{9.}	Splitting Length (µm):	9.				
Contour (C3) Parame	ters				> ///	/ (
Facing Offsets:	Down Facing (µm):	9. Middle (µm):	9. Up fac	ng (μm): 9.			/
Spikes	Approach	Retract				-	*
🗌 Overlap Length (j.	im): 9.	Splitting Length (um):	9.				
Additional Contour (Cr) Parameters					/	
Facing Offsets:	Down facing (µm):	9. Middle (µm):	9. Up fac	ng (µm): 9.			
Spikes	Approach	Retract					
🗌 Overlap Length (j.	im): 9.	Splitting Length (um):	9.				
Additional contour	rs: 0	Additional offset (µm):	0.01				
Alternation of sta	rtoffset (µm):	9.					
Concentric Contour Pa	rameters						
Source Contours:	Down facing:	None v Middle	None 🗸	Up facing: None	S. Middle: None		
Source Contour Offs	ets: Down Facing (µm):	40. Middle (µm)	: 40. Up f	acing (µm): 40.	S. Middle (µm): 40.		
Concentric Contours	No.: Down facing:	0 Middle:	0	Up facing: 0	S. Middle: 0		
Concentric Offsets:	Down facing (µm):	40. Middle (µm):	; 43. Up f.	acing (µm): 48.	S. Middle (µm): 43.		

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Setting for the individual Hatching Offsets:

Part_316L_LT-40						>
General Parameters	Contour Parameters Hatching	Parameters				
Hatching Parameters						^
Facing Offset: Down fa	cina (um): 9. Middle (um)	lin faring (um):	9.			
Spikes Rotation	Angles: By Global V	Use rotation free	zing and side shift instead			
Hatching to Down Facing	Area - String	Complete each b	atch line, including jump segments, bef	ore all else		
Side Step (um):	9. Start Angle (°):	9. Increment Angle (°):	Apply Strip Shift:	No		
Side Shift Inc. (um):	0.	Number of Layers to Freeze Rotation:	0			
Cell/Strip Height (um):	9. Cell Width (µm):	9. Along Overlap (µm):	9. No. or Sverlapping Side Steps	9		
Cell Border:	No V Offset to Middle (µm):	9. Overlap Middle (µm)	9.			
Scanning Order:	Continues ~	Hatch Direction:	Vertical 🗸			
		_				
Hatching to Middle Area -	Hexagonal Cells v	Complete each h	atch line, including jump segments, bef	ore all else		
Side Step (µm):	9 Start Angle (°):	9. Increment Angle (°):	9. Apply Strip Shift:	Yes 🗸	\geq	
Side Shift Inc. (µm):	0.	Number of Layers to Freeze Rotation:	0		(=	
Cell/Strip Height (um):	9 Min. Height (µm):	9 Along Overlap (µm):	9 No. of Overlapping Side Steps:	0		
Cell Border:	No v			l		
Scanning Order:	Continues ~	Hatch Direction:	Inside Out 🗸			1
<						>
Laser Parameters	Layering Parameters					📛 🗸 🛝 🚀

And yet, sometimes you may need to make a single change that will affect all the related parameters. This can be done from the Sintering Factors dialog.

Referring to the example above, you may need to make a single change that will affect all the offset values for all the contours and/or hatching.

Access the Sintering Factors dialog for the relevant buildstyle:

			Build Style N	ame		Setti	Sinte
			Part_Ni625	_LT-30	•		×=
			Wall-Support	_LT-60	-		24 <u>1</u>
Part_Part_Stainles	0.80 1.	1.20				•	ር
Velocities:	0.50 1.	2.00					
Offsets:	0.60 1.	1.50		t.			
later ing							
Power:	0.80 1.	1.20		(The			
Velocities:	0.50 1.	2.00					
Offsets:	0.60 1.	1.50					
Side Steps:	0.60 1.	1.50		t			



This dialog enable to control global Laser Power and Velocity & Offset values for both Contours and Hatching, and also the Side Steps for Hatching.

Thus, a change in the Offsets factor for Contours will affect all contour offsets set within the buildstyle. A factor of 1.2 for Contour offsets, for example, means that the offset value for each offset will increase by 1.2 (each offset value in the buildstyle will get multiplied by this factor).

Note that the Sintering Factor dialog is disabled for Certified LaserForm materials, as such a change means that such materials are no longer validated. However, if these materials are copied as new materials, they are enabled.