

Objet Material Information

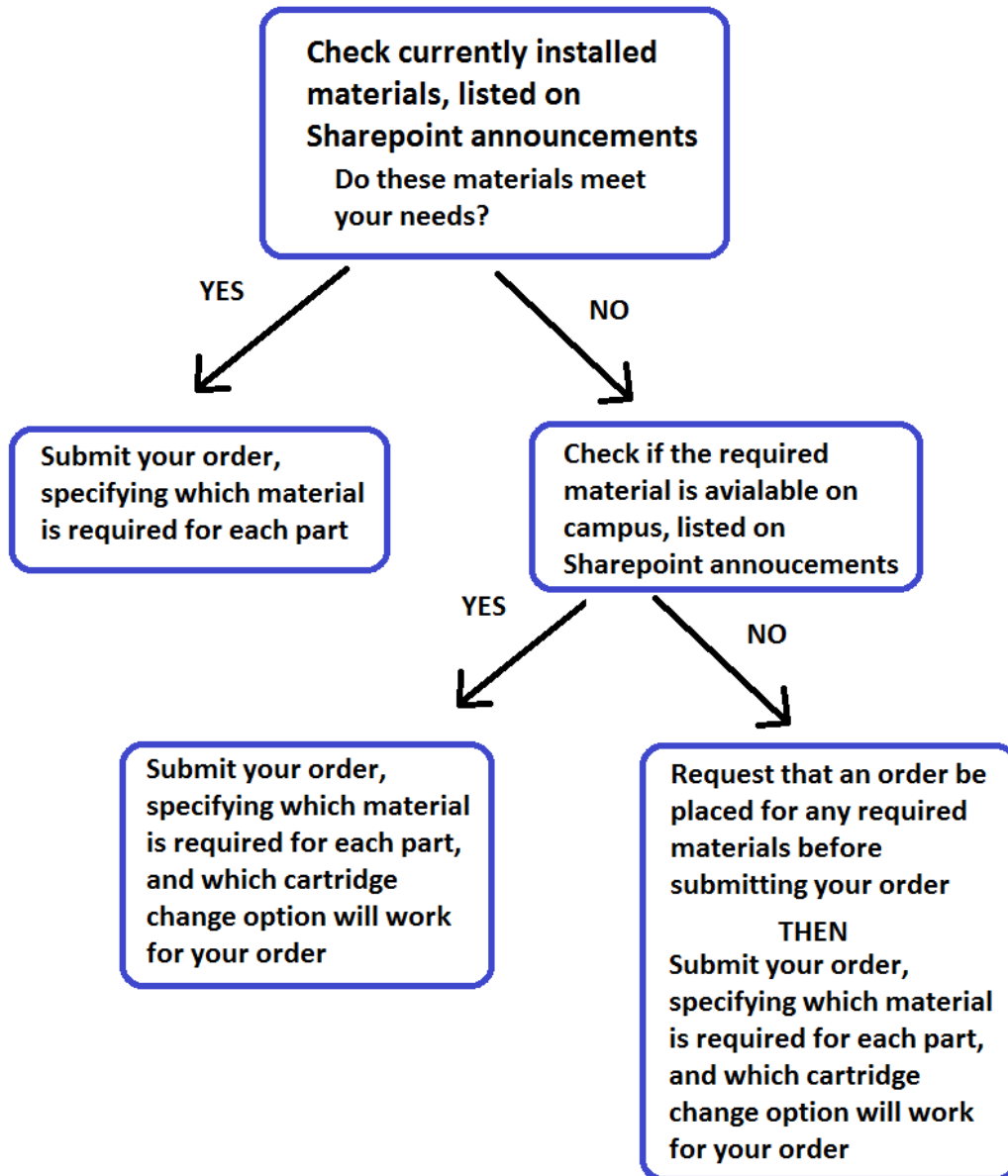
The Objet 260 Connex is capable of printing with a wide variety of materials. Unless otherwise noted below, most materials can be combined with one other material to create a range of different material properties. Information regarding the process of combining the available materials is available further on in this document.

In the table below, the commonly requested material properties are listed for materials that have been used on campus. A complete list of material properties for all materials is available on the following pages.

Material Name	Color	Durometer	Notes
VeroWhitePlus	opaque, white	rigid	Most frequently used
VeroBlackPlus	opaque, black	rigid	
VeroClear	transparent	rigid	
TangoPlus	translucent, yellow tint	flexible, rubber-like	
TangoBlackPlus	opaque, black	flexible, rubber-like	
MED610	transparent	rigid	Biocompatible; cannot be combined with other materials
ABS-Like	opaque, green	rigid	Cannot be combined with other materials; HDT of 58-68 C

When you are submitting an order for this machine, you must include the required material properties for your parts in the description field of the quote request. **Include any required material durometer and/or color characteristics.**

When planning to submit your order:



There are three available options when requesting a cartridge change:

1. The cartridge can be changed without a material purge, which will add nothing to the cost of your order, but will delay your parts about 3-4 days. This is not available for all material changes, or at all times during the term.
2. The cartridge can be changed with an economy material purge, which generally costs about \$40-60, but will only delay the order about 1-2 days.
3. The cartridge with a high efficiency purge, which generally costs between \$100-160, and will not delay the order. This is necessary for changes to ABS-Like or MED610.



Materials Simulating Engineering Plastics

Objet ABS-like Digital Material (RGD5160-DM) made of Objet RGD515 & Objet RGD535

	ASTM	Units	Metric	Units	Imperial
Tensile strength	D-638-03	MPa	55-60	psi	8000-8700
Elongation at break	D-638-05	MPa	25-40	psi	25-40
Modulus of elasticity	D-638-04	MPa	2600-3000	psi	375,000-435,000
Flexural Strength	D-790-03	MPa	65-75	psi	9,500-11,000
Flexural Modulus	D-790-04	MPa	1700-2200	psi	245,000-320,000
HDT, °C @ 0.45MPa	D-648-06	°C	58-68	°F	136-154
HDT, °C @ 0.45MPa after thermal post treatment procedure A	D-648-06	°C	82-90	°F	180-194
HDT, °C @ 0.45MPa after thermal post treatment procedure B	D-648-06	°C	92-95	°F	198-203
HDT, °C @ 1.82MPa	D-648-07	°C	51-55	°F	124-131
Izod Notched Impact	D-256-06	J/m	65-80	ft lb/inch	1.22-1.50
Tg	DMA, E»	°C	47-53	°F	117-127
Shore Hardness (D)	Scale D	Scale D	85-87	Scale D	85-87
Rockwell Hardness	Scale M	Scale M	67-69	Scale M	67-69

Objet High Temperature Material (RGD525)

	ASTM	Units	Metric	Units	Imperial
Tensile strength	D-638-03	MPa	70-80	psi	10,000-11,500
Elongation at break	D-638-05	%	10-15	%	10-15
Modulus of elasticity	D-638-04	MPa	3200-3500	psi	465,000-510,000
Flexural Strength	D-790-03	MPa	110-130	psi	16,000-19,000
Flexural Modulus	D-790-04	MPa	3100-3500	psi	450,000-510,000
HDT, °C @ 0.45MPa	D-648-06	°C	63-67	°F	145-163
HDT, °C @ 0.45MPa after thermal post treatment procedure A	D-648-06	°C	75-80	°F	167-176
HDT, °C @ 1.82MPa	D-648-07	°C	55-57	°F	131-135
Izod Notched Impact	D-256-06	J/m	14-16	ft lb/inch	0.262-0.300
Water Absorption, %	D-570-98 24hr	%	1.2-1.4	%	1.2-1.4
Tg	DMA, E»	°C	62-65	°F	144-149
Shore D	Scale D	Scale D	87-88	Scale D	87-88
Rockwell Hardness	Scale M	Scale M	78-83	Scale M	78-83
Polymerized density	ASTM D792	g/cm3	0.97-0.98		
Ash content	USP281	%	0.38-0.42	%	0.38-0.42

Materials Simulating Standard Plastics

Transparent Materials

Objet FullCure720

	ASTM	Units	Metric	Units	Imperial
Tensile strength	D-638-03	MPa	50-65	psi	7250-9450
Elongation at break	D-638-05	%	15-25	%	15-25
Modulus of elasticity	D-638-04	MPa	2000-3000	psi	290,000-435,000
Flexural Strength	D-790-03	MPa	80-110	psi	12000-16000
Flexural Modulus	D-790-04	MPa	2700-3300	psi	390,000-480,000
HDT, °C @ 0.45MPa	D-648-06	°C	45-50	°F	113-122
HDT, °C @ 1.82MPa	D-648-07	°C	45-50	°F	113-122
Izod Notched Impact	D-256-06	J/m	20-30	ft lb/inch	0.375-0.562
Water Absorption	D-570-98 24hr	%	1.5-2.2	%	1.5-2.2
Tg	DMA, E»	°C	48-50	°F	118-122
Shore Hardness (D)	Scale D	Scale D	83-86	Scale D	83-86
Rockwell Hardness	Scale M	Scale M	73-76	Scale M	73-76
Polymerized density	ASTM D792	g/cm3	1.18-1.19		
Ash content	USP281	%	0.01-0.02	%	0.01-0.02

Objet VeroClear FullCure810

	ASTM	Units	Metric	Units	Imperial
Tensile strength	D-638-03	MPa	50-65	psi	7250-9450
Elongation at break	D-638-05	%	10-25	%	10-25
Modulus of elasticity	D-638-04	MPa	2000-3000	psi	290,000-435,000
Flexural Strength	D-790-03	MPa	75-110	psi	11000-16000
Flexural Modulus	D-790-04	MPa	2200-3200	psi	320,000-465,000
HDT, °C @ 0.45MPa	D-648-06	°C	45-50	°F	113-122
HDT, °C @ 1.82MPa	D-648-07	°C	45-50	°F	113-122
Izod Notched Impact	D-256-06	J/m	20-30	ft lb/inch	0.375-0.562
Water Absorption	D-570-98 24hr	%	1.1-1.5	%	1.1-1.5
Tg	DMA, E»	°C	52-54	°F	126-129
Shore Hardness (D)	Scale D	Scale D	83-86	Scale D	83-86
Rockwell Hardness	Scale M	Scale M	73-76	Scale M	73-76
Polymerized density	ASTM D792	g/cm3	1.04-1.05		
Ash content	USP281	%	0.02-0.06	%	0.02-0.06

Rigid Opaque Materials

Objet VeroGray FullCure850, VeroBlack FullCure870, VeroWhitePlus FullCure835

	ASTM	Units	Metric	Units	Imperial
Tensile strength	D-638-03	MPa	50-65	psi	7250-9450
Elongation at break	D-638-05	%	10-25	%	10-25
Modulus of elasticity	D-638-04	MPa	2000-3000	psi	290,000-435,000
Flexural Strength	D-790-03	MPa	75-110	psi	11000-16000
Flexural Modulus	D-790-04	MPa	2200-3200	psi	320,000-465,000
HDT, °C @ 0.45MPa	D-648-06	°C	45-50	°F	113-122
HDT, °C @ 1.82MPa	D-648-07	°C	45-50	°F	113-122
Izod Notched Impact	D-256-06	J/m	20-30	ft lb/inch	0.375-0.562
Water Absorption	D-570-98 24hr	%	1.1-1.5	%	1.1-1.5
Tg	DMA, E»	°C	52-54	°F	126-129
Shore Hardness (D)	Scale D	Scale D	83-86	Scale D	83-86
Rockwell Hardness	Scale M	Scale M	73-76	Scale M	73-76
Polymerized density	ASTM D792	g/cm3	1.17-1.18		
Ash content VeroGray, VeroWhitePlus	USP281	%	0.23-0.26	%	0.23-0.26
Ash content VeroBlack	USP281	%	0.01-0.02	%	0.01-0.02

Objet VeroBlue FullCure840

	ASTM	Units	Metric	Units	Imperial
Tensile strength	D-638-03	MPa	50-60	psi	7250-8700
Elongation at break	D-638-05	%	15-25	%	15-25
Modulus of elasticity	D-638-04	MPa	2000-3000	psi	290,000-435,000
Flexural Strength	D-790-03	MPa	60-70	psi	8700-10200
Flexural Modulus	D-790-04	MPa	1900-2500	psi	265,000-365,000
HDT, °C @ 0.45MPa	D-648-06	°C	45-50	°F	113-122
HDT, °C @ 1.82MPa	D-648-07	°C	45-50	°F	113-122
Izod Notched Impact	D-256-06	J/m	20-30	ft lb/inch	0.375-0.562
Water Absorption	D-570-98 24hr	%	1.5-2.2	%	1.5-2.2
Tg	DMA, E»	°C	48-50	°F	118-122
Shore Hardness (D)	Scale D	Scale D	83-86	Scale D	83-86
Rockwell Hardness	Scale M	Scale M	73-76	Scale M	73-76
Polymerized density	ASTM D792	g/cm3	1.18-1.19		
Ash content Vblack	USP281	%	0.21-0.22	%	0.21-0.22

Polypropylene-like Materials

Objet DurusWhite FullCure430

	ASTM	Units	Metric	Units	Imperial
Tensile strength	D-638-03	MPa	20-30	psi	2900-4350
Elongation at break	D-638-05	%	40-50	%	40-50
Modulus of elasticity	D-638-04	MPa	1000-1200	psi	145,000-175,000
Flexural Strength	D-790-03	MPa	30-40	psi	4350-5800
Flexural Modulus	D-790-04	MPa	1200-1600	psi	175,000-230,000
HDT, °C @ 0.45MPa	D-648-06	°C	37-42	°F	99-108
HDT, °C @ 1.82MPa	D-648-07	°C	32-34	°F	90-93
Izod Notched Impact	D-256-06	J/m	40-50	ft lb/inch	0.749-0.937
Water Absorption	D-570-98 24hr	%	1.5-1.9	%	1.5-1.9
Tg	DMA, E»	°C	35-37	°F	95-99
Shore Hardness (D)	Scale D	Scale D	74-78	Scale D	74-78
Rockwell Hardness	Scale M	Scale M	no data	Scale M	no data
Polymerized density	ASTM D792	g/cm3	1.15-1.17		
Ash content	USP281	%	0.10-0.12	%	0.1-0.12

Rubber-like Materials

Objet TangoBlackPlus FullCure980 and TangoPlus FullCure930

	ASTM	Units	Metric	Units	Imperial
Tensile strength	D-412	MPa	0.8-1.5	psi	115-220
Elongation at break	D-412	%	170-220	%	170-220
Compressive set	D-395	%	4-5	%	4-5
Shore Hardness (A)	D-2240	Scale A	26-28	Scale A	26-28
Tensile Tear resistance	D-624	Kg/cm	2-4	Lb/in	18-22
Polymerized density	ASTM D792	g/cm3	1.12-1.13		

Objet TangoBlack FullCure970

	ASTM	Units	Metric	Units	Imperial
Tensile strength	D-412	MPa	1.8-2.4	psi	115-350
Elongation at break	D-412	%	45-55	%	45-55
Compressive set	D-395	%	0.5-1.5	%	0.5-1.5
Shore Hardness (A)	D-2240	Scale A	60-62	Scale A	60-62
Tensile Tear resistance	D-624	Kg/cm	3-5	Lb/in	18-24
Polymerized density	ASTM D792	g/cm3	1.12-1.13		

Objet TangoGray FullCure950

	ASTM	Units	Metric	Units	Imperial
Tensile strength	D-412	MPa	3-5	psi	435-725
Elongation at break	D-412	%	45-55	%	45-55
Compressive set	D-395	%	0.5-1.5	%	0.5-1.5
Shore Hardness (A)	D-2240	Scale A	73-77	Scale A	73-77
Tensile Tear resistance	D-624	Kg/cm	8-12	Lb/in	50-60
Polymerized density	ASTM D792	g/cm3	1.16-1.17		

Digital Materials

The following two pages are the material data sheets for the digital materials the Objet machine is capable of printing. Digital materials are obtained by combining resin from two cartridges. Both of these cartridges must be installed to create the listed digital material. The primary and secondary cartridges can be reversed, so any digital materials with that combination of cartridges can be included in the same print. Be sure, if you are selecting multiple digital materials, that each material requires the same two cartridges.

Samples of some digital materials are available for viewing upon request. If you have questions or concerns regarding the digital materials, please email for a meeting with the machine operator.



Simulating Standard Plastics

Transparent Materials

Primary material: FullCure720 **Secondary material:** VeroBlack

Property	ASTM	Units	DM_Dots_7513/ DM_Grid_7523
Tensile strength	D-638-03	MPa	50-65
Elongation at break	D-638-05	%	15-25
Modulus of elasticity	D-638-04	MPa	2000-3000
Flexural Strength	D-790-03	MPa	80-110
Flexural Modulus	D-790-04	MPa	2700-3300
HDT, °C @ 0.45MPa	D-648-06	°C	45-50
Izod Notched Impact	D-256-06	J/m	20-30

Primary material: FullCure720 **Secondary material:** TangoBlack

Property	ASTM	Units	DM_7210	DM_7220	DM_7230
Tensile strength	D-638-03	MPa	50-55	50-55	45-50
Elongation at break	D-638-05	%	15-25	15-25	15-25
Modulus of elasticity	D-638-04	MPa	2200-2500	2000-2300	1700-2000
Flexural Strength	D-790-03	MPa	80-90	75-85	70-80
Flexural Modulus	D-790-04	MPa	2300-2700	2200-2600	2100-2400
HDT, °C @ 0.45MPa	D-648-06	°C	45-50	45-50	45-50

Rigid Opaque Materials

Primary material: VeroWhitePlus **Secondary material:** Veroblack

Property	ASTM	Units	DM_8310, DM_8320, DM_8330
Tensile strength	D-638-03	MPa	50-65
Elongation at break	D-638-05	%	10-25
Modulus of elasticity	D-638-04	MPa	2000-3000
Flexural Strength	D-790-03	MPa	75-110
Flexural Modulus	D-790-04	MPa	2200-3200
HDT, °C @ 0.45MPa	D-648-06	°C	45-50
Izod Notched Impact	D-256-06	J/m	20-30

Primary material: VeroBlue **Secondary material:** VeroBlack

Property	ASTM	Units	DM_8210
Tensile strength	D-638-03	MPa	50-60
Elongation at break	D-638-05	%	15-25
Modulus of elasticity	D-638-04	MPa	2000-3000
Flexural Strength	D-790-03	MPa	60-70
Flexural Modulus	D-790-04	MPa	1900-2500
HDT, °C @ 0.45MPa	D-648-06	°C	45-50
Izod Notched Impact	D-256-06	J/m	20-30

Primary material: VeroWhitePlus **Secondary material:** TangoBlackPlus

Property	ASTM	Units	DM_8505Gray20 DM_8510_Gray25 DM_8515_Gray35 DM_8520_Gray40	DM_8525_Gray50
HDT at 0.45 MPa	D-648-06	°C	40-45	40-43
Tensile strength	D-638-03	MPa	40-60	35-45
Elongation at break	D-638-05	%	15-25	20-30
Modulus of elasticity	D-638-04	MPa	1700-2300	1400-2000
Izod Notched Impact	D-256-06	J/m	22-35	25-35
Flexural Strength	D-790-03	MPa	55-75	45-60
Flexural Modulus	D-790-04	MPa	1500-2500	1400-1800

Primary material: VeroWhitePlus **Secondary material:** TangoPlus

Property	ASTM	Units	DM_8425
HDT at 0.45 MPa	D-648-06	°C	40-43
Tensile strength	D-638-03	MPa	35-45
Elongation at break	D-638-05	%	20-30
Modulus of elasticity	D-638-04	MPa	1400-2000
Izod Notched Impact	D-256-06	J/m	25-35
Flexural Strength	D-790-03	MPa	45-60
Flexural Modulus	D-790-04	MPa	1400-1800

Polypropylene-like Materials

Primary material: DurusWhite **Secondary material:** VeroWhitePlus, VeroBule, VeroBlack or FullCure720

Property	ASTM	Units	DM_4310	DM_4410	DM_4510	DM_4710
Tensile strength	D-638-03	MPa	30-40	30-40	30-40	30-40
Elongation at break	D-638-05	%	40-50	40-50	40-50	40-50
Modulus of elasticity	D-638-04	MPa	1200-1600	1200-1600	1200-1600	1200-1600
Flexural Strength	D-790-03	MPa	40-50	40-50	40-50	40-50
Flexural Modulus	D-790-04	MPa	1300-1700	1300-1700	1300-1700	1300-1700
HDT, °C @ 0.45MPa	D-648-06	°C	40-45	40-45	40-45	40-45
Izod Notched Impact	D-256-06	J/m	35-45	35-45	35-45	35-45

Primary material: VeroWhitePlus **Secondary material:** TangoBlackPlus

Property	ASTM	Units	DM_8530_Gray60
HDT at 0.45 MPa	D-648-06	°C	38-41
Tensile strength	D-638-03	MPa	29-38
Elongation at break	D-638-05	%	25-35
Modulus of elasticity	D-638-04	MPa	1100-1700
Izod Notched Impact	D-256-06	J/m	21-40
Flexural Strength	D-790-03	MPa	35-45
Flexural Modulus	D-790-04	MPa	1200-1500

Primary material: VeroWhitePlus **Secondary material:** TangoPlus

Property	ASTM	Units	DM_8430
HDT at 0.45 MPa	D-648-06	°C	38-41
Tensile strength	D-638-03	MPa	29-38
Elongation at break	D-638-05	%	25-35
Modulus of elasticity	D-638-04	MPa	1100-1700
Izod Notched Impact	D-256-06	J/m	21-40
Flexural Strength	D-790-03	MPa	35-45
Flexural Modulus	D-790-04	MPa	1200-1500

Rubber-like Materials

Primary material: TangoBlackPlus/TangoPlus **Secondary material:** VeroWhitePlus

Property	ASTM	Units	DM_9840/ 9740	DM_9850/ 9750	DM_9860/ 9760	DM_9870/ 9770	DM_9885/ 9785	DM_9895/ 9795
Tensile strength	D-412	MPa	0.5-1.5	0.5-1.5	2-4	2-4	4-8	15-25
Elongation at break	D-412	%	150-170	130-150	80-100	50-70	50-60	25-35
Shore Hardness (A)	D-2240	Scale A	35-45	45-55	55-65	65-75	80-90	90-100
Tensile Tear resistance	D-624	Kg/cm	4-6	5-7	7-9	12-14	25-27	45-47

Primary material: TangoGray **Secondary material:** TangoBlack

Property	ASTM	Units	DM_9510
Tensile strength	D-412	MPa	1-3
Elongation at break	D-412	%	35-45
Shore Hardness (A)	D-2240	Scale A	60-70
Tensile Tear resistance	D-624	Kg/cm	5-7

Primary material: TangoBlack **Secondary material:** VeroWhitePlus, VeroBlue, VeroBlack, FullCure720

Property	ASTM	Units	DM_9110/9410 9210/9310	DM_9120/9420 9220/9320	DM_9130/9430 9230/9330
Tensile strength	D-412	MPa	2-4	3-5	7-11
Elongation at break	D-412	%	45-55	35-45	35-45
Shore Hardness (A)	D-2240	Scale A	75-85	80-90	90-100
Tensile Tear resistance	D-624	Kg/cm	7-9	13-17	45-50

Primary material: TangoGray **Secondary material:** VeroBlack

Property	ASTM	Units	DM_9610
Tensile strength	D-412	MPa	9-13
Elongation at break	D-412	%	45-55
Shore Hardness (A)	D-2240	Scale A	75-85
Tensile Tear resistance	D-624	Kg/cm	45-50



All data provided herein, which is related to consumables, was collected from specific specimens and tests conditions and is provided for information only. Characteristics may vary if different specimens and test conditions are applied. Unless expressly provided in writing, no warranties are made and warranties of merchantability or fitness for a particular purpose are expressly disclaimed.

info@objet.com | www.objet.com

Additional Information

Creating Assemblies:

Parts to be printed with multiple materials can be saved from assembly or part files. Each section requiring an additional material must be created as a separate part in the assembly, or a disconnected volume in a part file, to maintain those sections in the .stl file, and must have a gap of 0.0005 inches between each volume. It is not possible to add additional sections directly to the .stl file.

If a single part file has solid volumes that are not in contact (example: the ball-in-cage model), when the .stl is saved normally each volume can be separated into individual sections.

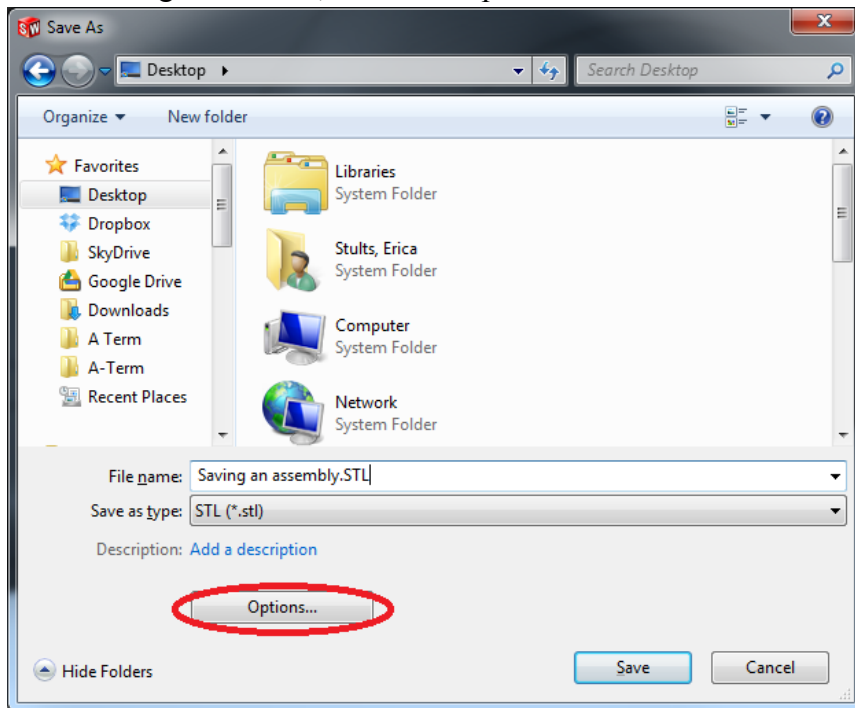
Volumes with less than a 0.0005 inch gap in the assembly or part file will be connected during printing. (Example: a brush with a rigid handle and flexible bristles.)

For moving assemblies, a 0.01 inch (0.3 mm) tolerance is required between touching surfaces.

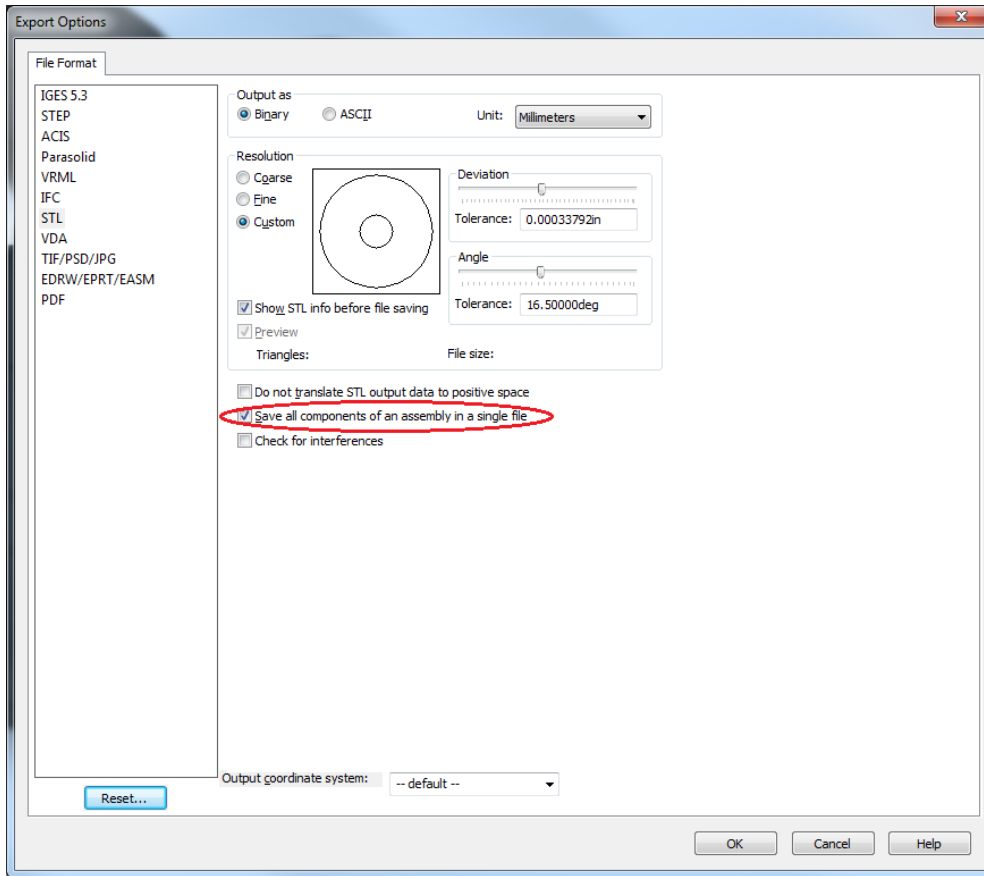
Saving an assembly as an .stl:

Solid works

When saving the .stl file, click on “Options...”

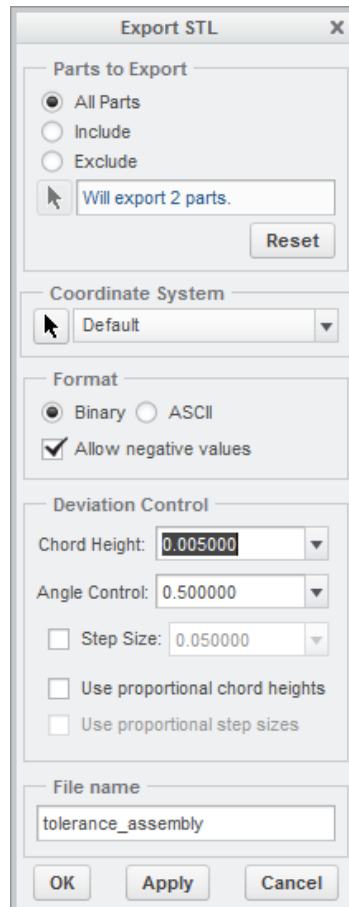


Be sure that “Save all components of an assembly in a single file” is selected. From here, proceed as usual.



Pro-Engineer/Creo:

Be sure to include all parts when saving the .stl.



Submitting Complex Orders:

Submit both your assembly .stl file, and each individual part .stl file. List each part with the material required (exceptions are made for assemblies with too many files for this to be practical).

Post Processing:

Post processing services are not included in your order.

Objet provides a description of post processing methods recommended for Objet parts here: <http://objet.com/solutions/post-print-application>. Examples include additional cleaning with a 2% NaOH solution, painting, polishing for clear models, and penetrating dye for translucent color.