Stereolithography Material Properties

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Details Stereolithography

Standard lead time:	From 2 working days, depending on the size of the parts and the number of components.
Standard accuracy:	Standard stereolithography ± 0.2% (min ± 0.2 mm). Sensitive to UV-light (e.g. direct sunlight)
Surface finish:	Different finishes from smooth finish up to high gloss can be obtained by post-finishing
Maximum part dimensions:	2100x700x800 mm
Capacity:	Materialise has over 30 stereolithography machines
Materials:	Tusk Somos® SolidGrey3000 TuskXC2700T / Tusk2700W Protogen White Poly1500 PerFORM Xtreme

Details Next Day Stereolithography

Standard Lead time:	Parts ordered before 12am can be shipped the same day
Standard Accuracy:	± 0.2% (min ± 0.2 mm)
Surface finish:	Basic finishing
Maximum part dimensions:	650 x 650 x 480 mm (x, y, z)
Capacity:	4 Next Day machines.
Materials:	Tusk2700W Poly1500

Details Mammoth Stereolithography

Standard Lead time:	From 2 working days, depending on the size of the parts and the number of components
Standard Accuracy:	± 0.2% (min ± 0.2 mm) Sensitive to UV-light (e.g. direct sunlight).
Surface finish:	Different finishes from smooth finish up to high gloss can be obtained by post-finishing
Maximum part dimensions:	2100x700x800 mm
Capacity:	13 Mammoth machines
Materials:	Tusk Somos® SolidGrey3000 TuskXC2700T Protogen White Poly1500

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Stereolithography Material Properties

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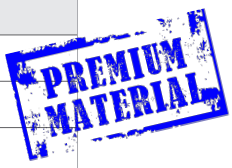
Datasheet			
Tusk Somos® SolidGrey3000			
	Units	ASTM#	Range
Density	g/cm³		1.18 – 1.2
Tensile Modulus	MPa	D638M	2970 – 3285
Tensile Strength at Yield	MPa	D638M	60 – 66
Elongation at Yield	%	D638M	3.0
Elongation at Break	%	D638M	4.6 – 7.2
Flexural Modulus	MPa	D790M	1843 – 2017
Hardness	ShoreD	D2240	84
Notched Izod Impact	J/m	D256A	30 – 35
Water Absorption	%	D570-98	0.36 – 0.40
Glass Transition Temperature	°C	E1545-05a	40 – 48
Heat Deflection Temp (0.46MPa)	°C	D648 - 07B	53 – 57
Heat Deflection Temp (1.82MPa)	°C	D648 - 07B	49 – 57
Colour	Opaque Gray		



- ✓ Stiff
- ✓ Impact resistant
- ✓ Water resistant
- ✓ Durable

- ✓ Automotive body parts
- ✓ Machine covers
- ✓ Functional prototypes
- ✓ Durable concept models
- ✓ Robust scale models

Datasheet			
TuskXC2700T / Tusk2700W			
	Units	ASTM#	Range
Density	g/cm³		1.18 – 1.2
Tensile Modulus	MPa	D638M	2650 – 2880
Tensile Strength	MPa	D638M	47.1 – 53.6
Elongation at Break	%	D638M	11 – 20
Flexural Modulus	MPa	D790M	2040 – 2370
Flexural Strength	MPa	D790M	63.1 – 74.16
Notched Izod Impact	J/m	D256A	20 – 30
Hardness	Shore D	D2240	81
Heat Deflection Temp (0.46 MPa)	°C	D648 - 98c	45.9 – 54.5
Heat Deflection Temp (1.81 MPa)	°C	D648 - 98c	49.0 – 49.7
Colour	Transparent or white		

- ✓ Transparent (TuskXC2700T)
- ✓ Strong
- ✓ Water resistant
- ✓ Durable

- ✓ Functional prototypes
- ✓ Wind tunnel testing
- ✓ Water flow analysis
- ✓ High-end finished models
- ✓ ABS-like parts

Last update: October 2016

Stereolithography Material Properties

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Datasheet			
Protogen White			
	Units	ASTM#	Range
Density	g/cm³		1.18 – 1.2
Tensile Modulus	MPa	D638M	2310
Tensile Strength	MPa	D638M	43.8
Elongation at Break	%	D638M	16
Flexural Modulus	MPa	D790M	2130
Flexural Strength	MPa	D790M	70.5
Notched Izod Impact	J/m	D256A	22
Hardness	Shore D	D2240	88
Water Absorption	%	D570-98	0.68%
Glass Transition Temperature	°C	E1545-00	57 – 59
Heat Deflection Temp (0.46 Mpa)	°C	D648 - 98c	56
Heat Deflection Temp (1.82 MPa)	°C	D648 - 98c	47
Colour	White		
	Actual values may vary with build conditions		

- ✓ Tough
- ✓ Good surface quality
- ✓ Good thermal properties
- ✓ Durable

- ✓ Impellers
- ✓ Duct work and connectors
- ✓ Automotive housings
- ✓ Dashboard assemblies
- ✓ High-end finished models

Datasheet			
Poly1500			
	Units	ASTM#	Range
Density	g/cm³		1.18 – 1.2
Tensile Modulus	MPa	D638M	1227 – 1462
Tensile Strength	MPa	D638M	30 – 32
Elongation at Break	%	D638M	15 – 25
Flexural Modulus	MPa	D790M	1310 – 1455
Flexural Strength	MPa	D790M	41 – 46
Notched Izod Impact	J/m	D256A	48 – 53
Hardness	Shore D	D2240	80 – 82
Heat Deflection Temp at 0.46 MPa	°C	D648	52 – 61
Colour	Translucent		

- ✓ Flexible
- ✓ Impact resistant
- ✓ Tough
- ✓ Durable

- ✓ Automotive components
- ✓ Electronic housings
- ✓ Snap-fit assemblies
- ✓ PP-like parts

Last update: October 2016

Stereolithography Material Properties

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Datasheet			
PerFORM			
	Units	ASTM#	Range
Density	g/cm³		1.61 @ 25°C
Tensile Modulus	MPa	D638M	10500
Tensile Strength	MPa	D638M	61.7 – 78
Elongation at Break	%	D638M	1.1
Flexural Modulus	MPa	D790M	10000
Flexural Strength	MPa	D790M	120
Notched Izod Impact	J/m	D256A	17
Water Absorption	%	D570-98	0,2
Heat Deflection Temp (0.46 MPa)	°C	D648-98c	225
Heat Deflection Temp (1.82 MPa)	°C	D648-98c	85 – 90
Colour	Off white		
	Actual values may vary with build conditions		

- ✓ Stiff
- ✓ High temperature resistance
- ✓ Superior sidewall quality

- ✓ High temperature applications
- ✓ Automotive
- ✓ Aerospace

Datasheet			
Xtreme			
	Units	ASTM#	Range
Density	g/cm³		1.18 – 1.2
Tensile Modulus	MPa	D638M	1790 – 1980
Tensile Strength	MPa	D638M	38 – 44
Elongation at Break	%	D638M	14 – 22
Flexural Modulus	MPa	D790M	1520 – 2070
Notched Izod Impact	J/m	D256A	35 – 52
Heat Deflection Temp (0.45 MPa)	°C	D648-98c	62
Heat Deflection Temp (1.82 MPa)	°C	D648-98c	54
Colour	Grey		
	Actual values may vary with build conditions		

- ✓ Tough
- ✓ Impact resistant
- ✓ High elongation at break
- ✓ Excellent surface quality

- ✓ Tough enclosures
- ✓ Snap-fit assemblies
- ✓ Replacing CNC machined parts
- ✓ High-end finished models

Last update: October 2016

Stereolithography Material Properties

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Name	Impact strength	Stiffness	Humidity resistance	Heat resistance	Durability	Colour	Mould	Details	Description	Applications
Tusk Somos® SolidGrey3000	Excellent	Excellent	Excellent	Good	Good	Grey	Good	Good	Stiff Impact resistant Water resistant Durable	Automotive body parts Machine covers Functional prototypes Durable concept models Robust scale models
TuskXC2700T Tusk2700W	Good	Good	Excellent	Sensitive	Good	Optical clear with a light blue tinge or White	Excellent	Moderate	Transparent (TuskXC2700T) Strong Water resistant Durable	Functional prototypes Wind tunnel testing Water flow analysis High-end finished models ABS-like parts
Protogen White	Good	Good	Good	Good	Good	White	Excellent	Good	Tough Good surface quality Good thermal properties Durable	Impellers Duct work and connectors Automotive housings Dashboard assemblies High-end finished models
Poly1500	Good	Moderate	Moderate	Moderate	Good	Translucent	Moderate	Good	Flexible Impact resistant Tough Durable	Automotive components Electronic housings Snap-fit assemblies PP-like parts
Xtreme	Excellent	Good	Good	Good	Good	Grey	Good	Excellent	Tough Impact resistant High elongation at break Excellent surface quality	Tough enclosures Snap-fit assemblies Replacing CNC machined parts High-end finished models
PerFORM	Sensitive	Excellent	Excellent	Excellent	Excellent	Off white	Moderate	Excellent	Stiff High temperature resistance Superior sidewall quality	High temperature applications Automotive Aerospace

Last update: October 2016

PolyJet Digital Material Properties

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Details PolyJet Digital Materials

Standard lead time: 2 – 4 working days

Standard accuracy: 0.1 – 0.3 mm
(accuracy varies according to geometry, part orientation and print size)

Surface finish: Support marks removed

Maximum part dimensions: 500x400x200 mm

Capacity: 3 Objet Machines

Primary Materials: Objet VeroWhitePlus is a general-purpose resin and has a white colour offering enhanced mechanical properties and the ability to withstand bending.
Objet TangoBlackPlus is a flexible rubber-like resin, offering exceptional elongation at break, making it suitable for prototypes of rubber components like seals, non-slip surfaces, etc.

Digital Materials: Composite materials with preset combinations of mechanical properties
Shore A40 – Shore A50 – Shore A60 – Shore A70 – Shore A85 – Shore A95

Multi-Material Models: To combine materials with different properties in one model, separate STL files are needed

Datasheet

PolyJet

	Units	ASTM#	Objet VeroWhitePlus
Tensile Strength	MPa	D-638	49.8
Elongation at Break	%	D-638	15% - 25%
Modulus of Elasticity	MPa	D-638	2495
Flexural Strength	MPa	D790	74.6
Flexural Modulus	MPa	D790	2137
Notched Izod Impact	J/m	D256	37.5
Hardness	Shore	Scale	83D
Rockwell	Scale M	Scale M	81.0
Heat Deflection Temp (0.45MPa)	°C	D648	47.6
Heat Deflection Temp (1.82MPa)	°C	D648	43.6
Glass Transition Temperature	°C	DMA, E"	58.0
Ash Content			<0.40%
Tensile Tear resistance	Kg/cm	D-324	
Colour			White
	Actual values may vary with build conditions		

Datasheet

PolyJet Digital Materials

Primary material: VeroWhitePlus Secondary material: TangoBlackPlus	DM_9840/ Shore A40	DM_9850/ Shore A50	DM_9860/ Shore A60	DM_9870/ Shore A70	DM_9885/ Shore A85	DM_9895 Shore A95
Tensile Strength (MPa)	0.5 – 1.5	0.5 – 1.5	2 – 4	2 – 4	4 – 8	15 – 25
Elongation at Break (%)	150 – 170	130 – 150	80 – 100	50 – 70	50 – 60	25 – 35
Shore (Scale A)	35 – 45	45 – 55	55 – 65	65 – 75	80 – 90	90 – 100
Colour	Black	Black	Black	Black	Black	Black

Last update: October 2016

Details Laser Sintering

Standard lead time: From 5 working days depending on part size, number of components and finishing degrees.
From 2 working days for smaller parts.

Standard accuracy: ± 0.3% (with lower limit of ± 0.3 mm)

Surface finish: Laser Sintering parts typically have a grainy surface but all kinds of (very) fine finishing are possible. They can be sandblasted, coloured, painted, covered, coated, polished, chemically smoothed, ...

Maximum part dimensions: Dimensions are unlimited when the parts may be composed of several sub-parts. The build area is 650x330x560 mm

Minimum wall thickness: 0.8 mm (1mm for PA Alu-filled and PA-GF), but living hinges are possible at 0.3 mm

Capacity: Materialise houses more than 20 LS machines

Datasheet

Laser Sintering

	Units	Condition	PA 12	PA-GF	PA Alu-filled (Alumide)
Description			Polyamide 12-standard	Stiff	Stiff, metallic look, and easy to mill
Density	g/cm³		0.95 +/- 0.03	1.22 +/- 0.03	1.36 +/- 0.05
Tensile Modulus	MPa	DIN EN ISO 527	1650 +/- 150	3200 +/- 200	3800 +/- 150
Tensile Strength	MPa	DIN EN ISO 527	48 +/- 3	51 +/- 3	48 +/- 3
Elongation at Break	%	DIN EN ISO 527	20 +/- 5	6 +/- 3	3.5 +/- 1
Flexural Modulus	N/mm²	DIN EN ISO 178	1500 +/- 130	2900 +/- 150	3600 +/- 150
Charpy – Impact strength	MPa	DIN EN ISO 179	53 +/- 3.8	35 +/- 6	29 +/- 2
Charpy – Notched Impact Strength	MPa	DIN EN ISO 179	4.8 +/- 0.3	5.4 +/- 0.6	4.6 +/- 0.3
Izod – Impact Strength	kJ/m²	DIN EN ISO 180	32.8 +/- 3.4	21.3 +/- 1.7	NA
Izod - Notched Impact Strength	kJ/m²	DIN EN ISO 180	4.4 +/- 0.4	4.2 +/- 0.3	NA
Ball Indentation Hardness		DIN EN ISO 2039	77.6 +/- 2	98	NA
Shore D/A-hardness		DIN 53505	D 75 +/- 2	D 80 +/- 2	D 76 +/- 2
Heat Deflection Temp	°C	ASTM D648 (1.82MPa)	86	110	130

Laser Sintering Material Properties

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Datasheet

TPU 92A-1

	Units	Condition	TPU 92A-1
Description			Strong and Flexible
Density	g/cm³		1.2
Tensile Strength	MPa	DIN EN ISO 527	27
Elongation at Break	%	DIN EN ISO 527	400
Flexural Modulus	N/mm²	DIN EN ISO 178	9
Shore A-hardness DIN 53505		DIN 53505	92
Abrasion resistance	mm³	ISO 4649	31
Vicat Softening Temperature A/50	°C	DIN EN ISO 306	90
	Actual values may vary with build conditions		

Datasheet

PA FR

	Units	Condition	PA 2241 FR	PA 2210 FR
Description			Passes aerospace flame resistance tests FAR 25.853	flame resistant parts with high mechanical properties
Tensile Modulus	MPa	DIN EN ISO 527	1900	2250 ± 150
Density	g/cm³		1.00 +/- 0.03	1.05 ± 0.05
Tensile Strength	MPa	DIN EN ISO 527	49	45 ± 3
Elongation at Break	%	DIN EN ISO 527	15	5.0 ± 1
Heat Deflection Temp	°C	ASTM D648 (1.82MPa)	84	
Flammability properties	mm	JAR/FAR 25, App. F, part 1| AITM 2.0002 B Vertical Bunsen Burner Test 12s Ignition Time	1.0/1.5/2.0	1.5/1.5
Smoke generation	mm	JAR/FAR 25, App. F – Part V & AITM 2.0007	1.0/1.5/2.0	1.5/2
Toxic gas generation	mm	AITM 3.0005	1.0/1.5/2.0	2.0
Flame retardancy				UL 94 V-0 2.0mm
	Actual values may vary with build conditions			

Last update: October 2016

Details FDM

Standard lead time:	4-5 days
Layer thickness:	0.25 mm (for ABS, ABSi) 0.18 – 0.25 mm (for ABS-M30, ABS-M30i, PC, PC-iso, PC-ABS) 0.18 mm (for ABS-ESD7) 0.25 mm (for ULTEM™ 9085)
Standard accuracy:	± 0.15% (min ± 0.2 mm)
Surface finish:	FDM parts typically have a rough surface but all kinds of (very) fine finishing are possible.
Maximum part dimensions:	Dimensions are unlimited as parts may be composed of several subparts. The maximum build envelope is 914x610x914 mm
Capacity:	Materialise houses more than 30 FDM machines
Materials:	FDM uses production-grade thermoplastic materials, suitable for detailed functional prototypes, durable manufacturing tools and low-volume manufacturing parts. Available materials: ABS ABSi ABS-M30 ABS-M30i ABS-ESD7 PC PC-ISO PC-ABS ULTEM 9085™

FDM Material Properties

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Datasheet			
ABS (Acrylonitrile / Butadiene / Styrene)			
	Units	ASTM#	Range
Tensile Strength	MPa	D638	22
Tensile Modulus	MPa	D638	1627
Flexural Strength	MPa	D790	41
Flexural Modulus	MPa	D790	1834
Notched Izod Impact	J/m	D256	107
Unnotched Izod Impact	J/m	D256	214
Heat Deflection Temp	°C	D648	at 0.45 MPa: 90 at 1.81 MPa: 76
Density	g/cm³		1.05
Elongation at Break	%		6
Colours	Blue, yellow, steel grey, green, black, white, grey		
	Actual values may vary with build conditions		

- ✓ Up to 80% of the strength of injection moulded ABS
- ✓ Durable
- ✓ Fine feature detail

- ✓ Snap-fits
- ✓ End-use components
- ✓ Jigs and fixtures
- ✓ Concept modelling
- ✓ Form, fit, and function testing

Datasheet			
ABSi (Biocompatible / Acrylonitrile / Butadiene / Stryrene)			
	Units	ASTM#	Range
Density	g/cm³		1.08
Tensile Strength	MPa	D638	37
Tensile Modulus	MPa	D638	1915
Flexural Strength	MPa	D790	62
Flexural Modulus	MPa	D790	1917
Notched Izod Impact	J/m	D256	96.4
Unnotched Izod Impact	J/m	D256	191.1
Heat Deflection Temp (0.45 MPa)	°C	D648	86
Heat Deflection Temp (1.81 MPa)	°C	D648	73
Elongation at Break	%		4.4
Colour	Translucent		
	Actual values may vary with build conditions		

- ✓ More stiff than ABS
- ✓ More durable than ABS
- ✓ Translucent

- ✓ End-use components
- ✓ Monitoring material flow
- ✓ Monitoring light transmission
- ✓ Medical applications
- ✓ Automotive applications

Last update: October 2016

FDM Material Properties

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Datasheet			
ABS-M30 (Acrylonitrile / butadiene / styrene)			
	Units	ASTM#	Range
Density	g/cm³		1.04
Tensile Strength	MPa	D638	36
Tensile Modulus	MPa	D638	2413
Flexural Strength	MPa	D790	61
Flexural Modulus	MPa	D790	2317
Notched Izod Impact	J/m	D256	139
Unnotched Izod Impact	J/m	D256	283
Heat Deflection Temp (0.45 MPa)	°C	D648	86
Heat Deflection Temp (1.81 MPa)	°C	D648	82
Elongation at Break	%		4
Colour	Ivory, White, Black, Dark Grey, Red, Blue		
	Actual values may vary with build conditions		

- ✓ 25-75% stronger than the standard ABS material
- ✓ Durable
- ✓ Multiple colours available

- ✓ End-use components
- ✓ Jigs and fixtures
- ✓ Concept modelling
- ✓ Form, fit, and function testing

Datasheet			
ABS-M30i (Biocompatible Acrylonitrile / Butadiene / Styrene)			
	Units	ASTM#	Range
Density	g/cm³		1.04
Tensile Strength	MPa	D638	36
Tensile Modulus	MPa	D638	2413
Flexural Strength	MPa	D790	61
Flexural Modulus	MPa	D790	2317
Notched Izod Impact	J/m	D256	139
Unnotched Izod Impact	J/m	D256	283
Heat Deflection Temp (0.45 MPa)	°C	D648	96
Elongation at Break	%		4
Flame Retardancy		UL94	HB 2.5 mm
Colour	Ivory		
	Actual values may vary with build conditions		

- ✓ Biocompatible: raw material meets ISO 10993
- ✓ 25-75% stronger than the standard ABS material
- ✓ Durable
- ✓ Fine feature detail

- ✓ Medical devices
- ✓ Food and drug packaging
- ✓ End-use components
- ✓ Form, fit, and function testing

Last update: October 2016

FDM Material Properties

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Datasheet			
ABS-ESD7 (Acrylonitrile / butadiene / styrene - Static Dissipative)			
	Units	ASTM#	Range
Tensile Strength	MPa	D638	36
Tensile Modulus	MPa	D638	2400
Flexural Strength	MPa	D790	61
Flexural Modulus	MPa	D790	2400
Notched Izod Impact	J/m	D256	111
Unnotched Izod Impact	J/m	D256	55
Heat Deflection Temp (0,45 MPa)	°C	D648	96
Heat Deflection Temp (1,81 MPa)	°C	D648	82
Volume Resistivity	ohms	D257	4.0*1010 – 3.0*109
Surface Resistance	ohms	D257	109 – 106
Colour	Black		
	Actual values may vary with build conditions		

- ✓ Electrostatic dissipative
- ✓ Durable

- ✓ End-use components
- ✓ Electronic products
- ✓ Industrial equipment
- ✓ Jigs and fixtures for assembly of electronic components

Datasheet			
PC (Polycarbonate)			
	Units	ASTM#	Range
Density	g/cm³		1.2
Tensile Strength	MPa	D638	68
Tensile Modulus	MPa	D638	2280
Flexural Strength	MPa	D790	104
Flexural Modulus	MPa	D790	2234
Notched Izod Impact	J/m	D256	53
Unnotched Izod Impact	J/m	D256	320
Heat Deflection Temp (0.45 MPa)	°C	D648	138
Heat Deflection Temp (1.81 MPa)	°C	D648	127
Elongation at Break	%		4.8
Flame Retardancy		UL 94	HB 1.5 mm
Colour	White		
	Actual values may vary with build conditions		

- ✓ Impact strength
- ✓ Temperature resistance
- ✓ Durable

- ✓ Snap-fits
- ✓ End-use components
- ✓ Jigs and fixtures
- ✓ Concept modelling
- ✓ Form, fit, and function testing

Last update: October 2016

FDM Material Properties

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Datasheet			
PC-ISO (Polycarbonate-ISO)			
	Units	ASTM#	Range
Density	g/cm³	D792	1.2
Tensile Strength	MPa	D638	41
Tensile Modulus	MPa	D638	1917
Flexural Strength	MPa	D790	68
Flexural Modulus	MPa	D790	1931
Notched Izod Impact	J/m	D256	196
Unnotched Izod Impact	J/m	D256	481
Heat Deflection Temp (0.45 MPa)	°C	D648	133
Heat Deflection Temp (1.81 MPa)	°C	D648	127
Elongation at Break	%	D638	4.3
Colour	White or translucent		
	Actual values may vary with build conditions		

- ✓ Biocompatible: raw material meets USP Class VI and ISO 10993-1
- ✓ Impact strength
- ✓ Temperature resistance
- ✓ Durable

- ✓ Medical devices
- ✓ Food and drug packaging
- ✓ End-use components
- ✓ Form, fit, and function testing

Datasheet			
PC-ABS (Polycarbonate / ABS blend)			
	Units	ASTM#	Range
Density	g/cm³		1.2
Tensile Strength	MPa	D638	41
Tensile Modulus	MPa	D638	1917
Flexural Strength	MPa	D790	68
Flexural Modulus	MPa	D790	1931
Notched Izod Impact	J/m	D256	196
Unnotched Izod Impact	J/m	D256	481
Heat Deflection Temp (0.45 MPa)	°C	D648	110
Heat Deflection Temp (1.81 MPa)	°C	D648	96
Elongation at Break	%	D638	6
Flame Retardancy		UL94	HB 1.5 mm
Colour	Black		
	Actual values may vary with build conditions		

- ✓ Impact strength
- ✓ Temperature resistance
- ✓ Durable

- ✓ Snap-fits
- ✓ End-use components
- ✓ Jigs and fixtures
- ✓ Concept modelling
- ✓ Form, fit, and function testing

Last update: October 2016

FDM Material Properties

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Datasheet			
ULTEM™ 9085			
	Units	ASTM#	Range
Density	g/cm³		1.34
Tensile Strength	MPa	D638	72
Tensile Modulus	MPa	D638	2220
Flexural Strength	MPa	D790	115
Flexural Modulus	MPa	D790	2507
Notched Izod Impact	J/m	D256	106
Unnotched Izod Impact	J/m	D256	613.8
Heat Deflection Temp (1,81 MPa)	°C	D648	153
Elongation at Break	%		5.9
Oxygen Index	%	D2863	49
Vertical Burn (Test a (60s), passes at)	s	FAR25.853	2
FAA Flammability (Method A/B)		FAR25.853	<5
OSU Peak Heat Release (5 minute test)	kW/m2	FAR25.853	36
OSU Peak Heat Release (2 minute test)	kW/min-/m2	FAR25.853	16
Certified Flame Retardancy		UL94	V-0 1.5 mm
Colour	Tan or Black		
	Actual values may vary with build conditions		

- ✓ Superior mechanical performance
- ✓ Excellent strength to weight ratio
- ✓ Flame resistant: low flame, low smoke and low toxicity
- ✓ Temperature resistance
- ✓ Aircraft components
- ✓ Automotive components

Last update: October 2016

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Details Vacuum Casting

Maximum part dimensions: The size of the mould is limited by the dimensions of the vacuum chamber (1900x900x750 mm) and by the volume of the product (maximum volume: 10 litres)

Minimum wall thickness: A wall thickness of at least 0.75mm is required. Best results are obtained with a wall thickness of at least 1.5mm.

Typical quantities: Up to 25 copies/mould (depending on the mould's complexity and the casting materials).

Special applications: Inserts, 2 component products

Casting material: Broad range of different polyurethanes that are similar to rubber, TPE, PP, ABS, PC. Colours approaching RAL-standard colours are available. See datasheets for more detailed information.

Capacity: 6 Vacuum Casting machines

Datasheet

Rubber-like polyurethanes

	Units	RPU4	RPU5	RPU6	RPU8	RPU10	RPU11	RPU12
Density	g/cm^3	1.02	1.08	1.09	1.18	1,02-1,07	1,14-1,15	1,05-1,1
Hardness 23°C	Shore A	63	79	85	70	35	51	95
Tensile Strength	MPa	3	12	17	4.3	1,5-3,5	3	9,5-11,5
Tear Strength	KPa	24	67	83	20	N/A	18	N/A
Elongation at break	%	1000	620	810	255	900-1100	1200	200-300
Colour		LIght Amber	Black	Black	Transparent	translucent	Beige	Translucent
Colourability in mass	-/+/++/+++	+	-	-	+++	++	+	++
Max. Operating T	°C	80	80	80	N.A.	70	70	70
	Actual values may vary with build conditions							

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Vacuum Casting Material Properties

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Datasheet

ABS-like polyurethanes

	Units	HMPU1	HMPU2	HMPU3	HMPU3P	HMPU4	HMPU6	HMPU7
Density	g/cm³	1.14	1.18	1.17	1.16	1.2	1.20	1.11
Hardness 25°C	Shore D	80	80	80	80	85	82	77
Hardness 60°C	Shore D	>65 (120°)	NA	70 (130°C)	70 (130°)	NA	NA	68 (80°)
Tensile Strength	MPa	60	60	54	54	70	70	40
Tensile Modulus	MPa	N.A.	2700	1650	1650	NA	N.A.	N.A.
Bending Strength	MPa	80	100	87	87	110	105	51
Bending Modulus	MPa	2300	2000	1600	1600	2500	2500	1310
Elongation at Break	%	11	7	11	11	9	15	25
Impact Strength	kJ/m²	>60 Charpy	75 Charpy	56 Charpy	56 Charpy	50	70 Charpy	N.A.
Glass Transition T	°C	>120	90-100	N.A.	NA	100	105	108
Heat Deflection Temp	°C	NA	72–94	120	120	NA	92	90
Max. Casting Thickness	mm	5–10	5	5–10	5-10	5	5	N.A.
Colour		Black	Off–white	Black	Beige	Opalescent	White	White
Colourability in Mass	-/+/++/+++	-	++	-	+	+	++	++
Special Purpose		High T Resistance	High Impact Resistance	High T Resistance	High T Resistance	Thermoplastic like parts	High T High Impact Resistance	Food Safe (FDA)
Thermoplastic Similarity		ABS	ABS	ABS	ABS	Polycarbonate, ABS	Polystyrene/ filled ABS	ABS
	Actual values may vary with build conditions							

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Vacuum Casting Material Properties

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Datasheet

ABS-like polyurethanes

	Units	HMPU10	HMPU11	HMPU13	HMPU14	HMPU15HQ
Density	g/cm³	1.2–1.25	1.19	1.04–1.08	1.17–1.23	1.06
Hardness 25°C	Shore D	85	80	85	85-90	86
Hardness 60°C	Shore D	80 (80°C)	65 (150°C)	N.A.	N.A.	NA
Tensile Strength	MPa	85	61	66	80–85	68
Tensile Modulus	MPa	N.A.	1800	2400	N.A.	2600
Bending Strength	MPa	150	80	110	105–115	100
Bending Modulus	MPa	4500	1850	2400	2250 – 2750	2100
Elongation at Break	%	3	13	7.5	6–8	6
Impact Strength	kJ/m²	30 Charpy	41 Charpy	48 Charpy	N.A.	42 Charpy
Glass Transition T	°C	95	220	95	N.A.	100
Heat Deflection Temp	°C	92	190-195	85	65–75	85
Max. Casting Thickness	mm	5	5	10	15	100
Colour		Off-White	Light Amber	Transparent	Straw	Transparent
Colourability in Mass	-/+/++/+++	+	+	+++	+	+++
Special Purpose		N.A.	High T Resistance	UV Stable	Flame Retardant UL 94 V-0	UV resistance, High transparency
Thermoplastic Similarity		Polyoxy-methylene/ POM	PA6.6/PPS/PEEK	PC/PMMA	N.A.	PC/PMMA
	Actual values may vary with build conditions					

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Vacuum Casting Material Properties

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Datasheet									
PE-PP-like polyurethanes									
	Units	LMPU1e	LMPU2	LMPU3	LMPU4	LMPU5	LMPU6	LMPU7	LMPU8
Density	g/cm³	1.03	1.22	1.13 - 1.17	1.08	1.21	1.21	1.21	1.21
Hardness 23°C	ShoreD	70/65	70	76	70	80	80	80	80
Hardness 80°C	ShoreD	63	64	68	N.A.	N.A.	N.A.	N.A.	N.A.
Tensile Strength	MPa	30	27	40	25	47	N.A.	N.A.	26
Tensile Modulus	MPa	N.A.	942	N.A.	530	1225	N.A.	N.A.	750
Elongation at Break	%	160	50	25	100	43	N.A.	N.A.	62
Tear Strength	kN/m	120	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Bending Strength	MPa	N.A.	42	80	30	60	48	64	27
Impact Strength	kJ/m²	>80 Charpy	15 Izod	> 50 Charpy	N.A.	14 Izod	15 Izod	13 Izod	11 Izod
Bending Modulus	MPa	N.A.	1050	1200	500	1310	1010	1320	645
Glass Transition T	°C	105	78	90	90 – 100	127 – 195	105 – 132	125 – 195	70 – 90
Heat Deflection T		N.A.	65	N.A.	55	105 – 175*	90 – 110*	115 – 180*	45 – 60*
Colour		Beige	White – Beige	Translucent	Beige	Translucent	Translucent	Translucent	Translucent
Colourability in Mass	-/+/++/+++	+	++	+++	+	+++	+++	+++	+++
Thermoplastic Similarity		PE	PP	PE 30% GF	PP/PEHD	PP GF	PP	PP GF	PEHD
	Actual values may vary with build conditions								

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Details R.I.M.

Minimum wall thickness:	2 to 2.5 mm
Maximum dimensions:	Up to 1.5m possible
Typical series size:	10 to 500 or more
Casting material:	A broad range of different polyurethanes that are similar to PA, PE, PP or ABS.
Process:	Low-pressure reaction injection moulding
Tool types:	Silicone tools based on stereolithography masters Hybrid tools based in stereolithography masters Rigid (hand lay up) tools based on stereolithography masters Machined (PU) tools
Surface finish:	High quality surface finishing after painting. Different finishing degrees possible: standard, painted, textured, labelling, ...
Capacity:	4 RIM machines

R.I.M. Material Properties

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Datasheet			
Rubber-like polyurethanes			
	Units	Standard	RIM1
Tensile Strength	MPa	ISO 527-66	7
Elongation at Break	%	ISO 527-66	300
Hardness	Shore A	ISO 868-85	73
Colour	Black		
Special purpose	Sealings		
	Actual values may vary with build conditions		

Datasheet				
PE-PP-ABS-like polyurethanes				
	Units	Standard	RIM 2	RIM 4
Flexural Modulus of elasticity	MPa	ISO 178-93	800	1800 – 2000
Tensile Strength	MPa	ISO 527-96	28	40 – 50
Elongation at Break	%	ISO 527-96	50	15 – 30
Impact Resistance	kJ/m²	ISO 179/1 eU-93	100	>30
Hardness	Shore D1	ISO 868-85	73	75 – 80
Maximum Usage T	°C		-40/+90	-20/+90
Colour			Black	Black
Special purpose			Impact resistance	Glass fibre reinforcement possible
	Actual values may vary with build conditions			

Datasheet			
Flame Retardant Polyurethanes			
	Units	Standard	RIM 5
Tensile Modulus	MPa	ISO 178-93	1300 – 1500
Tensile Strength	MPa	ISO 527-66	35 – 40
Elongation	%	ISO 527-66	8 – 12
Impact Strength	kJ/m²	ISO 179/1eU-93	> 27
Hardness	Shore D1	ISO 868-85	78 – 83
Maximum Usage T	°C		-20/+90
Colour	Brown		
Special purpose	Flame retardancy		
	Actual values may vary with build conditions		

Last update: October 2016

Details Metal 3D Printing

Standard lead time: Minimum of 11 working days depending on part size, number of components and required finishing

Standard accuracy: ± 0.2 % (with lower limit of ± 0.2 mm)

Surface finish: Depending on the material, different kinds of (very) fine finishing are possible: sandblasting, polishing, milling, ...

Maximum part dimensions: Dimensions are unlimited when the parts may be composed of several sub-parts.

Minimum wall thickness: 0.5 - 1mm

Datasheet

Aluminium - AlSi10Mg	Build area: 250x250x295mm		
	Units	Standard	Range (after heat treatment)
Density	g/cm³		2.68
Tensile Strength	MPa	DIN EN ISO 6892-1:2009	335 - 355
Elongation at Break	%	DIN EN ISO 6892-1:2009	9 - 13
E-Modulus	GPa	DIN EN ISO 6892-1:2009	50 - 70
Yield strength	MPa	DIN EN ISO 6892-1:2009	215 - 245
Hardness	HV5	DIN EN ISO 6506-1	114 - 124
Thermal conductivity	W/m°C		163 - 183
Relative Density	%		> 99.5
Specific Heat Capacity	J/(kg K)		840 - 940
Air - and Watertight	yes		
	Actual values may vary with build conditions		

Datasheet

Titanium - TiAl6V4	Build area: 250x250x255mm		
	Units	Standard	Range (after heat treatment)
Tensile strength	MPa	DIN EN ISO 6892-1:2009	min. 930
Yield Strength (Rp 0.2%)	MPa	DIN EN ISO 6892-1:2009	min. 860
Elongation at Break	%	DIN EN ISO 6892-1:2009	13 - 15
E-modulus	GPa	DIN EN ISO 6892-1:2009	104 - 124
Impact Strength	J		7 - 15
Hardness	HV5	DIN EN ISO 6507-1	308 - 332
Relative Density	%	> 99.5	
Density	g/cm³	4.41	
Air- and Watertight	Yes		
Max. Operating Temperature	°C	350	
	Actual values may vary with build conditions		

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Datasheet

Stainless Steel - 316L	Build area: 250x250x280mm		
	Units	Standard	Range (after heat treatment)
Density	g/cm³		7,9
Tensile Strength	MPa	DIN EN ISO 6892-1:2009	485 - 595
Elongation at Break	%	DIN EN ISO 6892-1:2009	25 - 55
E-Modulus	GPa	DIN EN ISO 6892-1:2009	180
Yield strength	MPa	DIN EN ISO 6892-1:2009	380 - 560
Hardness	HRB	DIN EN ISO 6508-1	89
Relative Density	%		Ca. 100
Specific Heat Capacity	J/(kg K)		500
Air - and Watertight	yes		
	Actual values may vary with build conditions		

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Details HSM

Minimum wall thickness:	1 mm
Standard Lead-Time:	10 - 12 working days
Standard Accuracy:	+/- 0.2% (min 0.2 mm)
Surface finish:	Different finishes possible on request
Materials:	PMMA, AL6061, POM and ABS.