MATERIAL DATA SHEET
SAF

Stratasys SAF™ PA12

Extended Material Datasheet

Overview

Processed with SAF™ technology on the Stratasys H350™ 3D printer, Stratasys SAF PA12 delivers production-grade plastic parts for high-volume demands — driving new areas of business growth. Stratasys SAF PA12 enables a high nesting density while maintaining high part consistency to deliver production-level yields.

Contents:

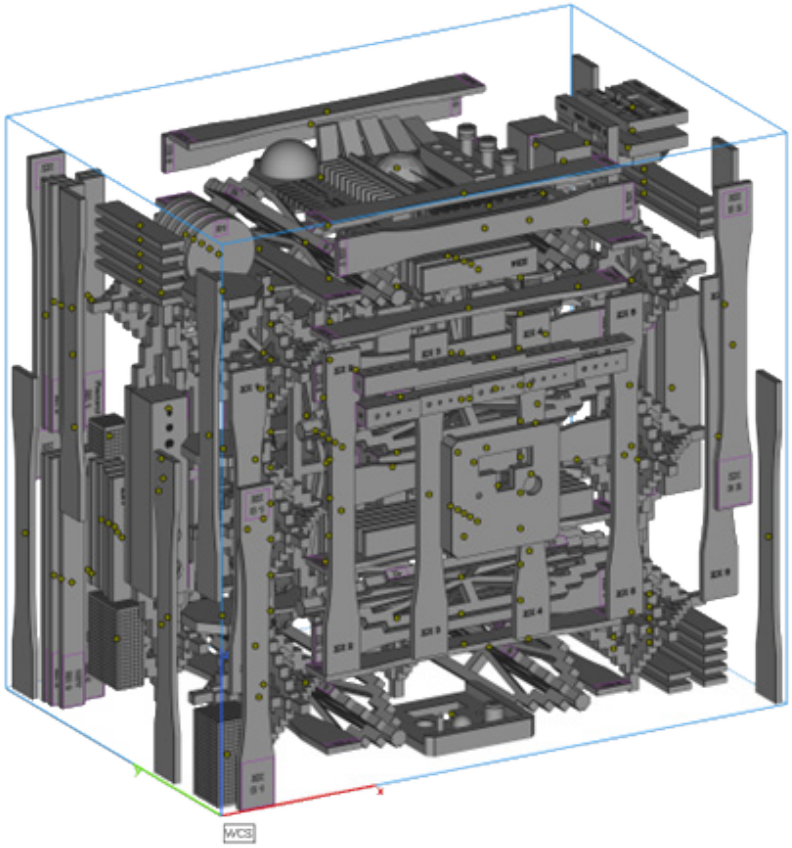


Figure 1: The Full Standard Test Build designed for PA12

Mechanical Properties

The mechanical data in this datasheet were generated from parts in the “Full Standard Test Build” (Figure 1) built using Stratasys SAF PA12, processed using SAF™ technology on the Stratasys H350. The “Full Standard Test Build” is robust in that it tests both mechanical and geometric performance from within the same build. However, the build itself has been modified to focus on specific customer PA12 requests (more accuracy, less mechanical data compared to the High Yield PA11 FSTB).

Comprehensive Sample Sizes

The mechanical data come from over 750 tensile specimens (>350 in X/Y and >350 in Z), 90 flexural specimens (60 in X/Y and 30 in Z) and 540 impact specimens (360 in X/Y and 180 in Z), all printed in 22 builds from 5 different printers split between 2 locations. Each build has 18 tensile specimens in the ZX orientation and 20 collectively in the X and Y orientations.

Standard Build and Test Practices

The build was prepared using GrabCAD Print Pro. The parts were built with standard machine settings following the H350 installation process. The material consisted of 70% used and 30% virgin powder by mass, as per PA12 H350 guidelines. Post processing of parts followed H350 guidelines including 24 hours cooling after removal from the machine, manual breaking out, and powder removal via automated bead blasting. No further post processing was performed. All testing was based on ASTM or ISO standards where applicable. All parts were preconditioned according to ASTM D618-13.

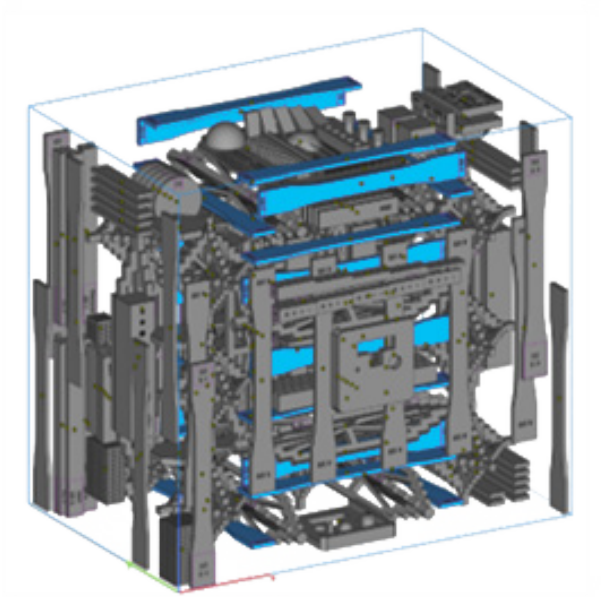


Figure 2: The placement of the X/Y tensile specimens shown for the full build (above) and tensile only (below)

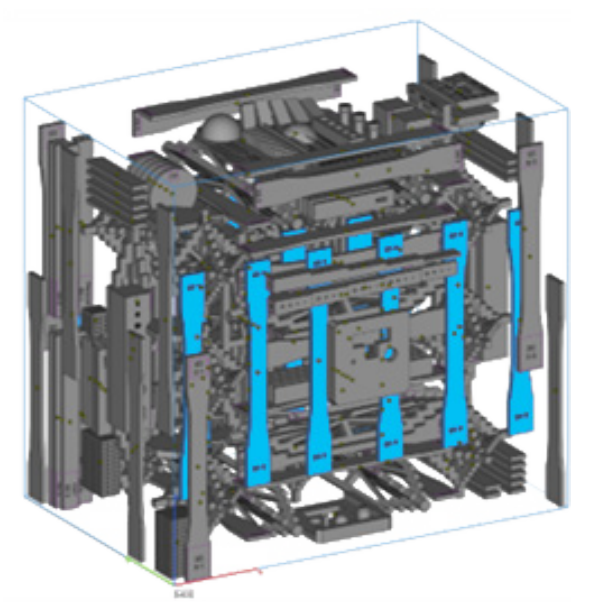
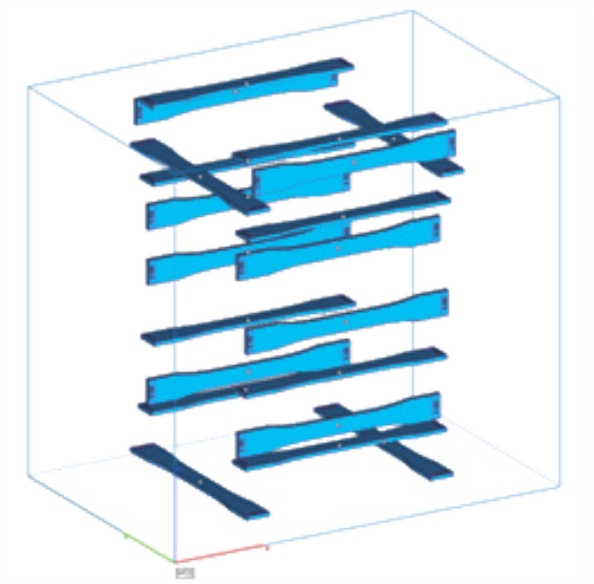
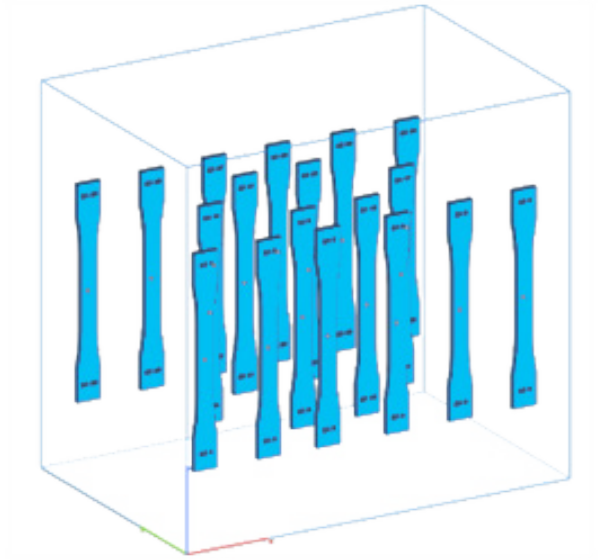


Figure 3: The placement of the ZX tensile specimens shown for the full build (above) and tensile only (below)





Full Build Characterization

The “Full Standard Test Build” contains a wide spread of ASTM D638-14 Type 1 tensile specimens in three orientations: ZX (upright), XZ (on end) and XY/YX (laid flat).

The 20 XY, XZ and YX specimens (highlighted in Figure 2) and the 18 ZX specimens (highlighted in Figure 3) are comprehensively placed within the test build, allowing full characterization of the build volume and real confidence in the mechanical performance of the H350.

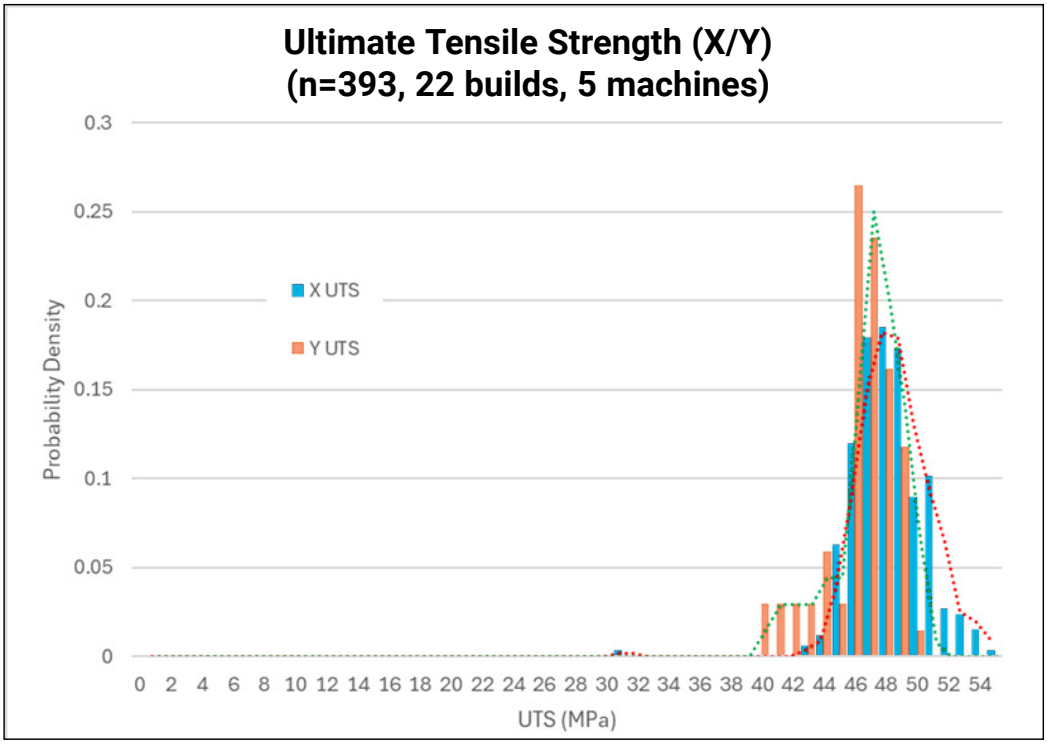
The test build also contains geometric property specimens, physical property specimens and give-away parts at a part nesting density of 12%.

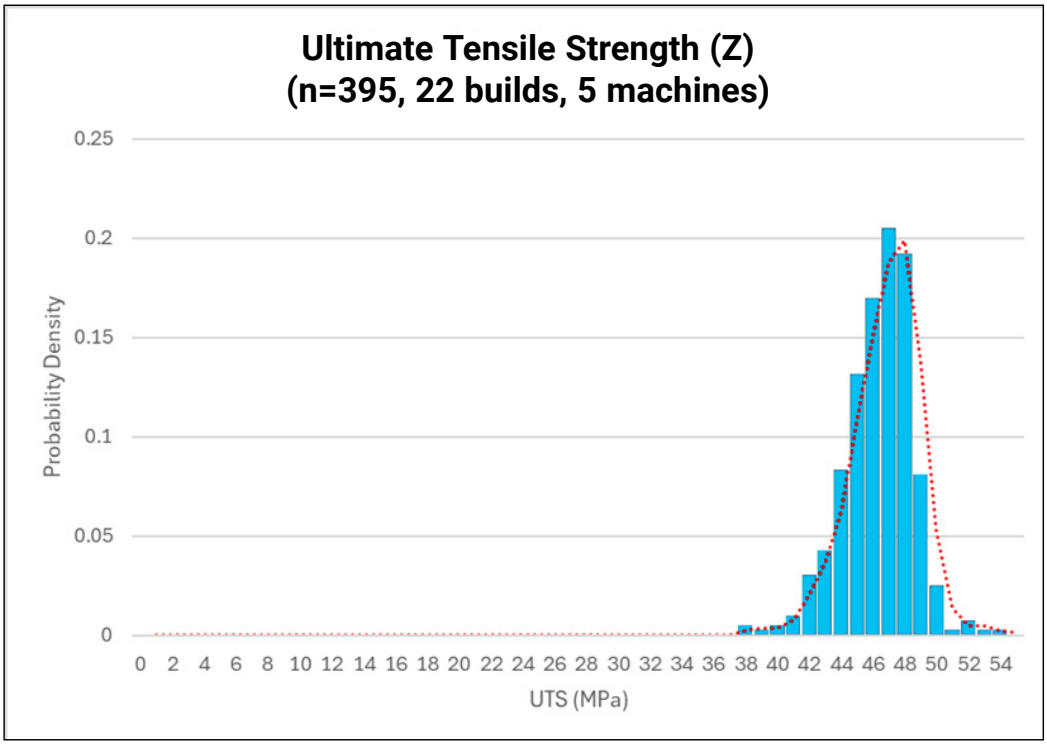
Property	Mean	Standard Deviation	Unit	Standard
Tensile Strength (XZ,YX)	47 (6817)	2.3 (754)	MPa (psi)	ASTM D638-14
Tensile Strength (ZX)	45 (6672)	2.2 (319)	MPa (psi)	ASTM D638-14
Elongation at Break (XZ,YX)	11	2.2	%	ASTM D638-14
Elongation at Break (ZX)	6	1.7	%	ASTM D638-14
0.2% Offset Yield Strength (XZ,YX)	33.5 (4859)	-	MPa (psi)	ASTM D638-14
0.2% Offset Yield Strength (ZX)	32.2 (4670)	-	MPa (psi)	ASTM D638-14
Tensile Modulus (XZ,YX)	1750 (254)	100 (14)	MPa (ksi)	ASTM D638-14
Tensile Modulus (ZX)	1700 (247)	100 (14)	MPa (ksi)	ASTM D638-14
Flexural Strength (XZ,YX)	54 (7816)	2 (271)	MPa (psi)	ASTM D790-17
Flexural Strength (ZX)	57 (8272)	1 (169)	MPa (psi)	ASTM D790-17
Flexural Modulus (XZ,YX)	1405 (208)	60 (8.7)	MPa (ksi)	ASTM D790-17
Flexural Modulus (ZX)	1525 (221)	29.7 (4.3)	MPa (ksi)	ASTM D790-17
Notched Impact Strength (XZ,YX)	4.17 (1.98)	-	kJ/m^2 ($Ft.lbf/in^2$)	ASTM D256-10
Notched Impact Strength (ZX)	3.36 (1.6)	-	kJ/m^2 ($Ft.lbf/in^2$)	ASTM D256-10

Mechanical Properties

The below histograms visualize the mechanical data presented in this datasheet:

Ultimate Tensile Strength (UTS)





Geometric Properties

The following geometric data were generated from the same builds as the previous mechanical data, made possible by the H350's ability to make both strong and accurate parts with the same settings. All parts were built and post-processed using the same standard methods as stated in the mechanical section. All parts were measured with a Aberlink EXTOL 370 CMM. The geometric data comes from a geometric "star" (nominal range from 5 to 80mm). The placement of these star parts can be seen in Figure 4.

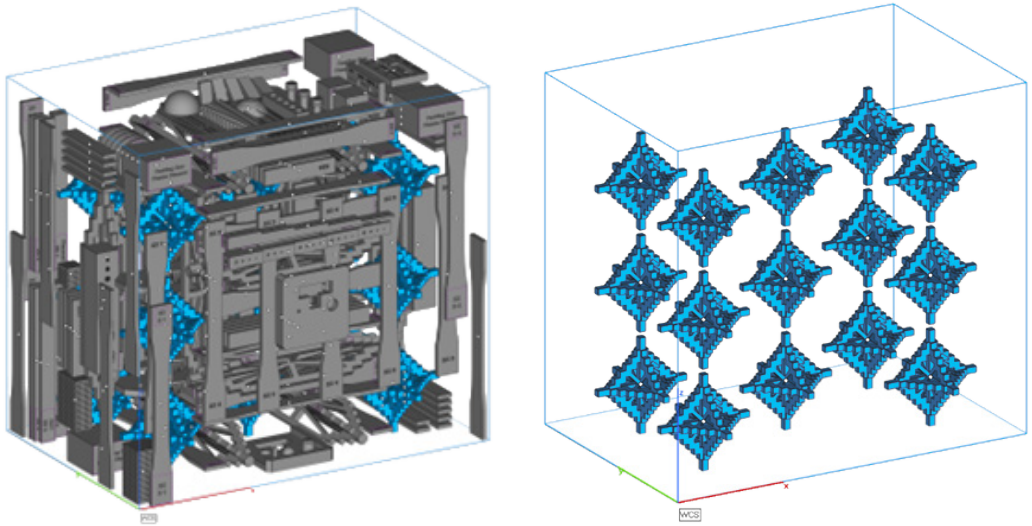
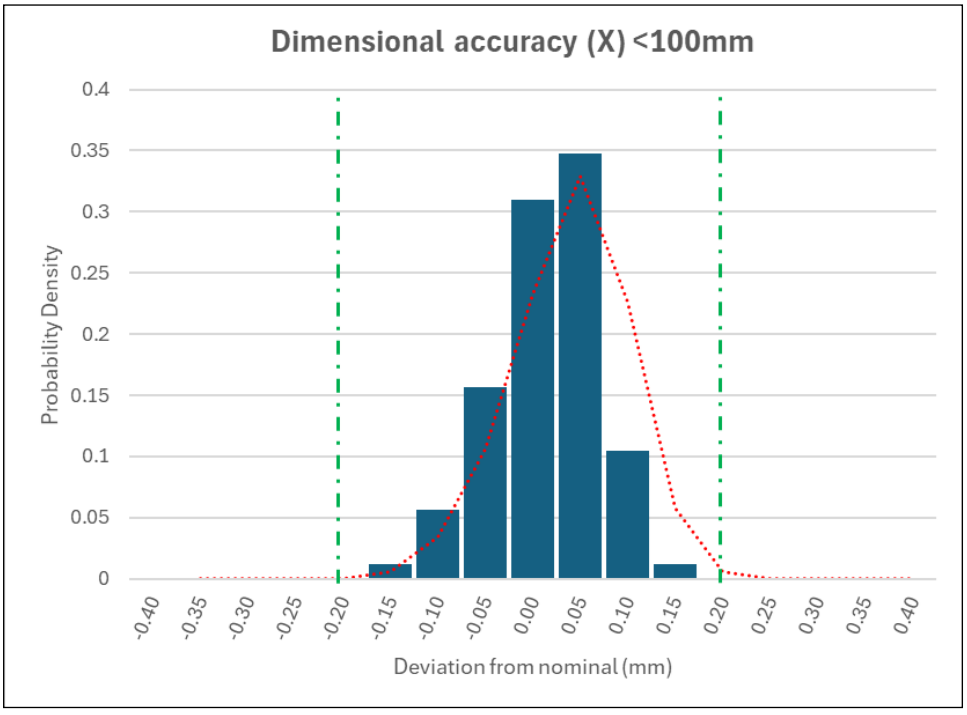
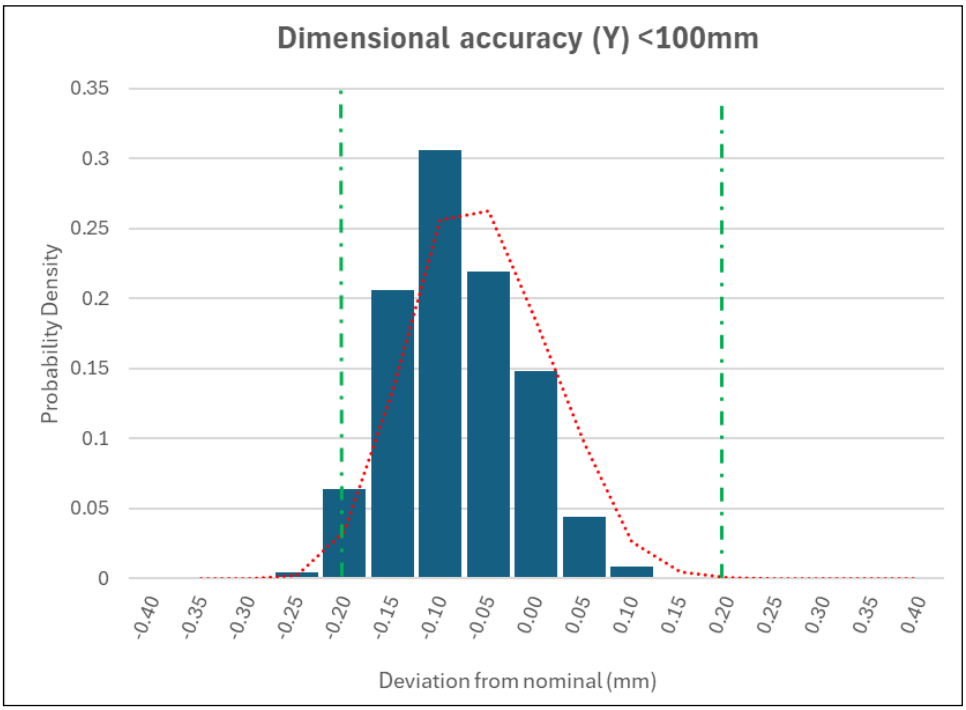
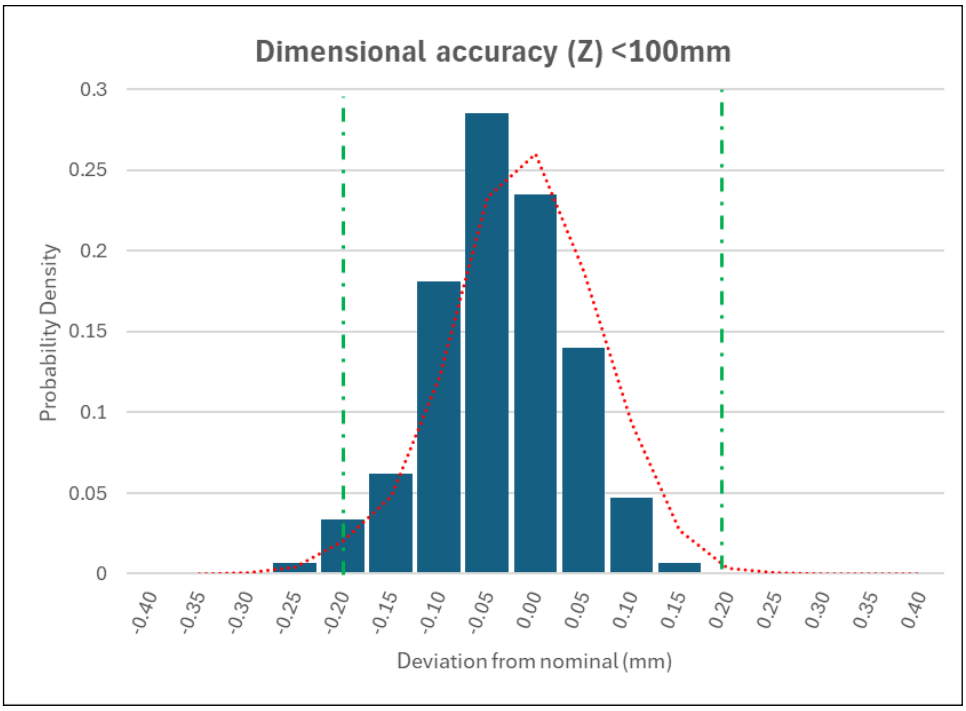


Figure 4: The placement of the geometric specimens within the full test build (left) and placement of the 15 geometric specimens only (right)

The below histograms visualize the geometric data presented in this datasheet – split into X, Y and Z measurements.







Tolerance	Yield (XY)	Yield (Z)
± 200µm (8 thou)	96.6%	95.8%

Physical Properties

General	Value	Unit	Standard
Part Specific Gravity	0.98	-	ASTM D792-13
Virgin Particle Size D50	56 (2.2)	µm (thou)	-
Virgin Powder Melting Point	185 (365)	°C (°F)	-
Thermal	**Mean**	**Unit**	**Standard**
Heat Deflection Temperature (0.45MPa/65psi)	173 (343)	°C (°F)	ASTM D648
Heat Deflection Temperature (1.82MPa/264psi)	77 (171)	°C (°F)	ASTM D648
Coefficient of Thermal Expansion	160 (0.089)	µm/°C.m (thou/in.°F)	ASTM E831
Specific Heat Capacity (20°C/68°F)	1.69 (0.4)	J/g.°C (BTU/lbm.°F)	ASTM E1952
Thermal Conductivity (23°C/68°F)	0.192 (1.34)	W/°C.m (BTU/hr.ft.°F)	ASTM E1952
Electrical	**Mean**	**Unit**	**Standard**
Surface resistivity	5.53 x10^{13}	Ohm	ASTM D257
Volume resistivity	4.19 x10^{14}	Ohm-cm	ASTM D257
Bio compatibility	**Result**	**Unit**	**Standard**
Determination of Sensitization - human cell line activation test (h-Clat)	Non-Sensitizer	N/A	OECD 442E 2018-06
Determination of Skin Irritation	Non-irritant	N/A	ISO 10993-10 2014-10 / OECD 439 2015-07
Determination of Cytotoxicity	Material shows no cytotoxic effect	N/A	DIN EN ISO 10993-5, 2009, Annex D
Flammability	**Mean**	**Unit**	**Standard**
UL94 HB	Pass*	Not Applicable	UL94 (2013)
Reusability	**Value**	**Unit**	**Standard**
Typical Powder Mix Ratio (Virgin)	30	%	-

*Product is not currently UL Blue Card Registered.

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[2] The specifications and/or information on which this document is based are subject to change without notice.

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