

Stratasys High Yield PA11 Material Properties

Preliminary information, subject to change

Processed with SAF™ technology on the Stratasys H350™ 3D printer, Stratasys High Yield PA11 delivers production-grade plastic parts for high-volume demands — driving new areas of business growth. Stratasys High Yield PA11 enables a high nesting density while maintaining high part consistency to deliver production-level yields.

In additive manufacturing, PA12 is the go-to material for prototyping. But in traditional high-volume production of end-use parts, PA11 is much more widely used due to its higher ductility and higher impact resistance, as well as its suitability for a wider range of industry applications. PA11 is also eco-friendly and 100 percent bio-based from sustainable castor oil.

The mechanical data below provide a good characterization of the entire build volume across multiple printers. It was generated after measuring more than 2000 tensile specimens (972 in X/Y and 1,080 in Z direction), 540 flexural specimens (360 in X/Y and 180 in Z) and 540 impact specimens (360 in X/Y and 180 in Z), all printed in 36 builds from 5 different printers. These specimens were widely and regularly distributed throughout the build volume, in a 12% nesting density build and produced with default printer settings.

Property	Mean	Standard Deviation	Unit	Standard
Tensile Strength (XZ,YX)	51 (7397)	2.2 (319)	MPa (psi)	ASTM D638-14
Tensile Strength (ZX)	47 (6817)	4.4 (638)	MPa (psi)	ASTM D638-14
Elongation at Break (XZ,YX)	30	5.6	%	ASTM D638-14
Elongation at Break (ZX)	11	4.8	%	ASTM D638-14
0.2% Offset Yield Strength (XZ,YX)	35 (5076)	1.6 (232)	MPa (psi)	ASTM D638-14
0.2% Offset Yield Strength (ZX)	34 (4931)	2.5 (363)	MPa (psi)	ASTM D638-14
Tensile Modulus (XZ,YX)	1529 (222)	76 (11)	MPa (ksi)	ASTM D638-14
Tensile Modulus (ZX)	1609 (233)	99 (14)	MPa (ksi)	ASTM D638-14
Flexural Strength (XZ,YX)	35 (5033)	2.3 (327)	MPa (psi)	ASTM D790-17
Flexural Strength (ZX)	36 (5280)	2.9 (414)	MPa (psi)	ASTM D790-17
Flexural Modulus (XZ,YX)	826 (120)	65 (9.5)	MPa (ksi)	ASTM D790-17
Flexural Modulus (ZX)	885 (128)	79 (11.5)	MPa (ksi)	ASTM D790-17
Notched Impact Strength (XZ,YX)	Pending		kJ/m ² (Ft.lbf/in ²)	ASTM D256-10
Notched Impact Strength (ZX)	Pending		kJ/m ² (Ft.lbf/in ²)	ASTM D256-10
General	Value	Unit	Standard	
Part Specific Gravity	1.02	-	ASTM D792-13	
Virgin Particle Size D50	47 (1.9)	µm (thou)	-	
Virgin Powder Melting Point	202 (396)	°C (°F)	-	

Stratasys High Yield PA11 Material Properties

Surface	Value	Unit	Standard
Surface Roughness, Top Surface (Ra)	8.5 (0.3)	µm (thou)	ISO 4287
Surface Roughness, Bottom Surface (Ra)	7.2 (0.3)	µm (thou)	ISO 4287
Surface Roughness, Sidewall (Ra)	7.9 (0.3)	µm (thou)	ISO 4287
Thermal	Value	Unit	Standard
Heat Deflection Temperature (0.45MPa/65psi)	185 (365)	°C (°F)	ASTM D648
Heat Deflection Temperature (1.82MPa/264psi)	47 (117)	°C (°F)	ASTM D648
Coefficient of Thermal Expansion	171 (0.095)	µm/°C.m (thou/in.°F)	ASTM E831
Specific Heat Capacity (20°C/68°F)	1.72 (0.411)	J/g.°C (BTU/lbm.°F)	ASTM E1952
Thermal Conductivity (20°C/68°F)	0.263 (0.152)	W/°C.m (BTU/hr.ft.°F)	ASTM E1952
Reusability	Value	Unit	Standard
Typical Powder Mix Ratio (Virgin)	30	%	-

Tests were performed on parts produced on the H350 with Xaar 3D's Full Standard Test Build (FSTB), with 12% nesting density, on multiple machines after a standard installation process, using the default machine settings with 70/30 reused/virgin mix throughout the testing process. H350 installation includes Xaar 3D's standard calibration process. Post processing of parts followed H350 recommended guidelines including 24 hours cooling after removal from the machine, manual breaking out, and powder removal via automated bead blasting with no further post processing. All testing was to ASTM or ISO standards where applicable. All mechanical parts were preconditioned according to ASTM D618-13.

Disclaimer:

1. Customer acknowledges the contents of this document and that Stratasys parts, materials, and supplier are subject to its standard terms and conditions, available on <http://www.stratasys.com/legal/terms-and-conditions-of-sale>, which are incorporated herein by reference.
2. The specifications and/or information on which this document is based are subject to change without notice.
3. The information presented are typical values intended for reference and comparison purposes only. They should not be used for design specifications or quality control purposes. End-use material performance can be impacted (+/-) by, but not limited to, part design, end-use conditions, test conditions, etc. Actual values will vary with build conditions. Tested parts were built on the Stratasys H350 3D printer. Product specifications are subject to change without notice. The performance characteristics of these materials may vary according to application, operating conditions, or end use. Each user is responsible for determining that the Stratasys material is safe, lawful, and technically suitable for the intended application, as well as for identifying the proper disposal (or recycling) method consistent with applicable environmental laws and regulations. Stratasys makes no warranties of any kind, express or implied, including, but not limited to, the warranties of merchantability, fitness for a particular use, or warranty against patent infringement.

Stratasys Headquarters

7665 Commerce Way,
Eden Prairie, MN 55344
+1 800 801 6491 (US Toll Free)
+1 952 937-3000 (Intl)
+1 952 937-0070 (Fax)

1 Holtzman St., Science Park,
PO Box 2496
Rehovot 76124, Israel
+972 74 745 4000
+972 74 745 5000 (Fax)

stratasys.com
ISO 9001:2015 Certified

© 2021 Stratasys. All rights reserved. Stratasys, the Stratasys Signet logo, Stratasys Direct Manufacturing, H350 and H Series, are trademarks or registered trademarks of Stratasys Inc. The H350 printer is subject to a license from Loughborough University Enterprises Limited and Evonik IP GmbH under the following and/or related patents and patent applications and their family members: EP2739457, EP3539752, EP1648686, EP 1740367, EP1737646, EP1459871. Further details including live and in-force status of family members may be found at <https://worldwide.espacenet.com/patent/search/family/>. SAF, Selective Absorption Fusion, Big Wave, HAF, Xaar and the Xaar square dot logo are trademarks of Xaar companies. All other trademarks are the property of their respective owners, and Stratasys assumes no responsibility with regard to the selection, performance, or use of these non Stratasys products. Product specifications subject to change without notice. MDS_SAF_PA11_0821a

