

HP 3D High Reusability PA 11

Materials Technical Fact Sheet

General Properties

Common information for all print modes

Category	Measurement	Value	Method
General Properties	Powder melting point (DSC)	202°C/396°F	ASTM D3418
	Particle size	54 µm	ASTM D3451
	Bulk density of powder	0.48 g/cm ³ 0.017 lb/in ³	ASTM D1895
	Density of parts	1.05 g/cm ³ 0.038 lb/in ³	ASTM D792
Reusability	Refresh ratio for stable performance	30%	
Recommended environmental conditions	Recommended relative humidity	50-70% RH	

Balanced print mode

Technical specifications¹

Category	Measurement	Specimen	Value	Method
Mechanical properties	Tensile strength, max load, ² XY, XZ, YX, YZ	Type V	52 MPa/7542 psi	ASTM D638
		Type I	52 MPa/7542 psi	ASTM D638
	Tensile strength, max load, ² ZX, ZY	Type V	52 MPa/7542 psi	ASTM D638
		Type I	52 MPa/7542 psi	ASTM D638
	Tensile modulus, ² XY, XZ, YX, YZ	Type V	1800 MPa/261 ksi	ASTM D638
		Type I	1800 MPa/261 ksi	ASTM D638
	Tensile modulus, ² ZX, ZY	Type V	1800 MPa/261 ksi	ASTM D638
		Type I	1800 MPa/261 ksi	ASTM D638
	Elongation at break, ² XY, XZ, YX, YZ	Type V	50%	ASTM D638
		Type I	35%	ASTM D638
	Elongation at break, ² ZX, ZY	Type V	35%	ASTM D638
		Type I	25%	ASTM D638
	Elongation at Yield, XY, XZ, YX, YZ	Type V	25%	ASTM D638
		Type I	24%	ASTM D638
	Elongation at Yield, ZX, ZY	Type V	22%	ASTM D638
		Type I	20%	ASTM D638
	Flexural modulus, ³ XY, XZ, YX, YZ		1800 MPa/261 ksi	ASTM D790
	Flexural modulus, ³ ZX, ZY		1800 MPa/261 ksi	ASTM D790
	Flexural strength (@ 5%), ³ XY, XZ, YX, YZ		70 MPa/10150 psi	ASTM D790
	Flexural strength (@ 5%), ³ ZX, ZY		70 MPa/10150 psi	ASTM D790
	Charpy impact notched (@23°C/73.4°F), XY, XZ, YX, YZ		5 kJ/m ²	ISO 179-1/1eA
	Charpy impact notched (@23°C/73.4°F), ZX, ZY		4.5 kJ/m ²	ISO 179-1/1eA
	Charpy impact unnotched (@23°C/73.4°F), XY, XZ, YX, YZ		125 kJ/m ²	ISO 179-1/1eU
	Charpy impact unnotched (@23°C/73.4°F), XY, XZ, YX, YZ		100 kJ/m ²	ISO 179-1/1eU
	Izod impact notched (@3.2 mm/0.126 in, 23°C/73.4°F), XY, XZ, YX, YZ		5.0 kJ/m ²	ASTM D256 Test Method A
	Izod impact notched (@3.2 mm/0.126 in, 23°C/73.4°F), ZX, ZY		4.5 kJ/m ²	ASTM D256 Test Method A
	Izod impact notched (@10 mm/0.394 in, 23°C/73.4°F), XY, XZ, YX, YZ		4 kJ/m ²	ASTM D256 Test Method A



Category	Measurement	Specimen	Value	Method
Mechanical properties	Izod impact notched (@10 mm/0.394 in, 23°C/73.4°F), Z		3.5 kJ/m ²	ASTM D256 Test Method A
	Izod impact unnotched (@3.2 mm/0.126 in, 23°C/73.4°F), XY, XZ, YX, YZ		140 kJ/m ²	ASTM D256 Test Method A
	Izod impact unnotched (@3.2 mm/0.126 in, 23°C/73.4°F), ZX, ZY		110 kJ/m ²	ASTM D256 Test Method A
	Compression Modulus, XY, XZ, YX, YZ, ZX, ZY		1600 MPa/232 ksi	ASTM D695
	Compression Strength (@10%), XY, XZ, YX, YZ, ZX, ZY		60 MPa/8702 ksi	ASTM D695
	Rockwell – Ball Indentation Hardness (@100kg, Scale E), XY, XZ, YX, YZ, ZX, ZY		70	ASTM D785
	Shore Hardness D, XY, XZ, YX, YZ, ZX, ZY		80	ASTM D2240
	Roughness		8 µm	ASTM D7127
Thermal properties	Heat deflection temperature (@0.45 MPa, 66 psi), XY, XZ, YX, YZ		185°C/365°F	ASTM D648 Test Method A
	Heat deflection temperature (@0.45 MPa, 66 psi), ZX, ZY		185°C/365°F	ASTM D648 Test Method A
	Heat deflection temperature (@1.82 MPa, 264 psi), XY, XZ, YX, YZ		54°C/129°F	ASTM D648 Test Method A
	Heat deflection temperature (@1.82 MPa, 264 psi), ZX, ZY		54°C/129°F	ASTM D648 Test Method A
	Vicat softening temperature (@A-10N), XY, XZ, YX, YZ, ZX, ZY		185 °C/365 °F	ASTM D1525 Test rate A
	Vicat softening temperature (@A-50N), XY, XZ, YX, YZ, ZX, ZY		175 °C/347 °F	ASTM D1525 Test rate A

Coefficient of Linear Thermal Expansion (Test Method ASTM E831)

Coefficient thermal expansion [µm/(m °C)]		
Orientation	Measurement zone	
XY, XZ, YX, YZ	Below Tg	135
	Above Tg	225
ZX, ZY	Below Tg	115
	Above Tg	190

Tg temperature: 45°C / 113°F

Fast print mode

Technical specifications¹

Category	Measurement	Specimen	Value	Method
Mechanical properties	Tensile strength, max load, ² XY, XZ, YX, YZ	Type V	52 MPa/7542 psi	ASTM D638
		Type I	52 MPa/7542 psi	ASTM D638
	Tensile strength, max load, ² ZX, ZY	Type V	50 MPa/7252 psi	ASTM D638
		Type I	50 MPa/7252 psi	ASTM D638
	Tensile modulus, ² XY, XZ, YX, YZ	Type V	1800 MPa/261 ksi	ASTM D638
		Type I	1800 MPa/261 ksi	ASTM D638
	Tensile modulus, ² ZX, ZY	Type V	1800 MPa/261 ksi	ASTM D638
		Type I	1800 MPa/261 ksi	ASTM D638
	Elongation at break, ² XY, XZ, YX, YZ	Type V	50%	ASTM D638
		Type I	30%	ASTM D638
	Elongation at break, ² ZX, ZY	Type V	10%	ASTM D638
		Type I	10%	ASTM D638
	Elongation at Yield, XY, XZ, YX, YZ	Type V	25%	ASTM D638
		Type I	24%	ASTM D638
	Elongation at Yield, ZX, ZY	Type V	10%	ASTM D638
		Type I	10%	ASTM D638
	Flexural modulus, ³ XY, XZ, YX, YZ		1800 MPa/261 ksi	ASTM D790
	Flexural modulus, ³ ZX, ZY		1800 MPa/261 ksi	ASTM D790
	Flexural strength (@ 5%), ³ XY, XZ, YX, YZ		70 MPa/10152 psi	ASTM D790
	Flexural strength (@ 5%), ³ ZX, ZY		70 MPa/10152 psi	ASTM D790
	Charpy impact notched (@23°C/73.4°F), XY, XZ, YX, YZ		5.0 kJ/m ²	ISO 179-1/1eA
	Charpy impact notched (@23°C/73.4°F), ZX, ZY		4.0 kJ/m ²	ISO 179-1/1eA
	Izod impact notched (@3.2 mm/0.126 in, 23°C/73.4°F), XY, XZ, YX, YZ		5.0 kJ/m ²	ASTM D256 Test Method A
	Izod impact notched (@3.2 mm/0.126 in, 23°C/73.4°F), ZX, ZY		4.5 kJ/m ²	ASTM D256 Test Method A
	Izod impact notched (@10 mm/0.394 in, 23°C/73.4°F), XY, XZ, YX, YZ		4.0 kJ/m ²	ASTM D256 Test Method A
	Izod impact notched (@10 mm/0.394 in, 23°C/73.4°F), ZX, ZY		3.5 kJ/m ²	ASTM D256 Test Method A
Thermal properties	Heat deflection temperature (@0.45 MPa, 66 psi), XY, XZ, YX, YZ		185°C/365°F	ASTM D648 Test Method A
	Heat deflection temperature (@0.45 MPa, 66 psi), ZX, ZY		185°C/365°F	ASTM D648 Test Method A
	Heat deflection temperature (@1.82 MPa, 264 psi), XY, XZ, YX, YZ		55°C/131°F	ASTM D648 Test Method A
	Heat Deflection Temperature (@1.82 MPa, 264 psi), ZX, ZY		55°C/131°F	ASTM D648 Test Method A

Mechanical print mode

Technical specifications¹

Category	Measurement	Specimen	Value	Method
Mechanical properties	Tensile strength, max load, ² XY, XZ, YX, YZ	Type V	52 MPa/7542 psi	ASTM D638
		Type I	52 MPa/7542 psi	ASTM D638
	Tensile strength, max load, ² ZX, ZY	Type V	52 MPa/7542 psi	ASTM D638
		Type I	52 MPa/7542 psi	ASTM D638
	Tensile modulus, ² XY, XZ, YX, YZ	Type V	1800 MPa/261 ksi	ASTM D638
		Type I	1800 MPa/261 ksi	ASTM D638
	Tensile modulus, ² ZX, ZY	Type V	1800 MPa/261 ksi	ASTM D638
		Type I	1800 MPa/261 ksi	ASTM D638
	Elongation at break, ² XY, XZ, YX, YZ	Type V	60%	ASTM D638
		Type I	40%	ASTM D638
	Elongation at break, ² ZX, ZY	Type V	50%	ASTM D638
		Type I	30%	ASTM D638
	Elongation at Yield, XY, XZ, YX, YZ	Type V	25%	ASTM D638
		Type I	24%	ASTM D638
	Elongation at Yield, ZX, ZY	Type V	22%	ASTM D638
		Type I	20%	ASTM D638
	Flexural modulus, ³ XY, XZ, YX, YZ		1700 MPa/247 ksi	ASTM D790
	Flexural modulus, ³ ZX, ZY		1700 MPa/247 ksi	ASTM D790
	Flexural strength (@ 5%), ³ XY, XZ, YX, YZ		65 MPa/9427 psi	ASTM D790
	Flexural strength (@ 5%), ³ ZX, ZY		65 MPa/9427 psi	ASTM D790
	Charpy impact notched (@23°C/73.4°F), XY, XZ, YX, YZ		6 kJ/m ²	ISO 179-1/1eA
	Charpy impact notched (@23°C/73.4°F), ZX, ZY		5.5 kJ/m ²	ISO 179-1/1eA
	Izod impact notched (@3.2 mm/0.126 in, 23°C/73.4°F), XY, XZ, YX, YZ		5.5 kJ/m ²	ASTM D256 Test Method A
	Izod impact notched (@3.2 mm/0.126 in, 23°C/73.4°F), ZX, ZY		5.0 kJ/m ²	ASTM D256 Test Method A
	Izod impact notched (@10 mm/0.394 in, 23°C/73.4°F), XY, XZ, YX, YZ		5.0 kJ/m ²	ASTM D256 Test Method A
	Izod impact notched (@10 mm/0.394 in, 23°C/73.4°F), ZX, ZY		5.0 kJ/m ²	ASTM D256 Test Method A
Thermal properties	Heat deflection temperature (@0.45 MPa, 66 psi), XY, XZ, YX, YZ		185°C/365°F	ASTM D648 Test Method A
	Heat deflection temperature (@0.45 MPa, 66 psi), ZX, ZY		185°C/365°F	ASTM D648 Test Method A
	Heat deflection temperature (@1.82 MPa, 264 psi), XY, XZ, YX, YZ		55°C/131°F	ASTM D648 Test Method A
	Heat deflection temperature (@1.82 MPa, 264 psi), ZX, ZY		55°C/131°F	ASTM D648 Test Method A

Print mode profiles

Profiles based on average XYZ values



Print mode comparison table

Profiles based on average XYZ values

	Speed	Mechanical properties	Look & feel	PQ Robustness	Dimensional accuracy	Dimensional warpage
Balanced	=	=	=	=	=	=
Mechanical	↓	↑	=	=	↓	=
Fast	↑	↓	=	=	↑	↑

Certifications

- USP Class I-VI
- US FDA guidance for Intact Skin Surface Devices

Dynamic security enabled printer. Only intended to be used with cartridges using an HP original chip. Cartridges using a non-HP chip may not work, and those that work today may not work in the future. More at: hp.com/go/learnaboutsupplies

For more information, please visit
hp.com/go/3DMaterials

1. The following technical information should be considered representative of averages or typical values and should not be used for specification purposes. These values are with FW TAGDAG_15_18_11.69 and have been obtained from a sample of specimens printed in plots with 6% packing density. Separation between specimens in the plot was 10 mm. Modulus has been calculated using the slope of the regression line between 0.05% and 0.25% strain measured with an automatic extensometer during the entire test. Cross-section dimension measures are done using a micrometer with round ends. Conditioning according to ASTM D618 Procedure A: 48 hours after printing and unpacking of the parts at 23°C/73°F and 50% RH. Orientations defined according to ASTM F2971.

2. Test results realized under the ASTM D638 with a test rate of 50 mm/min and 10 mm/min for type I and type V, respectively.

3. Test results realized under ASTM D790 Procedure B at a test rate of 13.55 mm/min.

© Copyright 2018 HP Development Company, L.P.

Nothing herein should be construed as constituting an additional warranty. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services and/or in a written agreement between you and HP. HP believes that the information herein is correct based on the current state of scientific knowledge and as the date of its publication, however, to the maximum extent permitted by law HP EXPRESSLY DISCLAIMS ANY REPRESENTATIONS AND WARRANTIES OF ANY KIND, WHETHER EXPRESS OR IMPLIED, AS TO THE ACCURACY, COMPLETENESS, NON-INFRINGEMENT, MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE (EVEN IF HP IS AWARE OF SUCH PURPOSE) WITH RESPECT TO ANY INFORMATION PROVIDED. Except to the extent that exclusion is prevented by law, HP shall not be liable for technical or editorial errors or omissions, and damages or losses of any kind or nature that result from the use of or reliance upon this information, which is subject to change without notice. The HP Jet Fusion 3D products have not been designed, manufactured or tested by HP for compliance with legal requirements for specific 3D printed parts and their uses, and recipients are responsible for determining the suitability of HP Jet Fusion 3D products for their uses, ensuring compliance with applicable laws and regulations, and being aware that other safety or performance considerations may arise when using, handling or storing the product.

