

HP 3D HR PA12, enabled by Evonik

Material Extended Datasheet with the HP Jet Fusion 5600
Series 3D Printing Solutions



March 2026

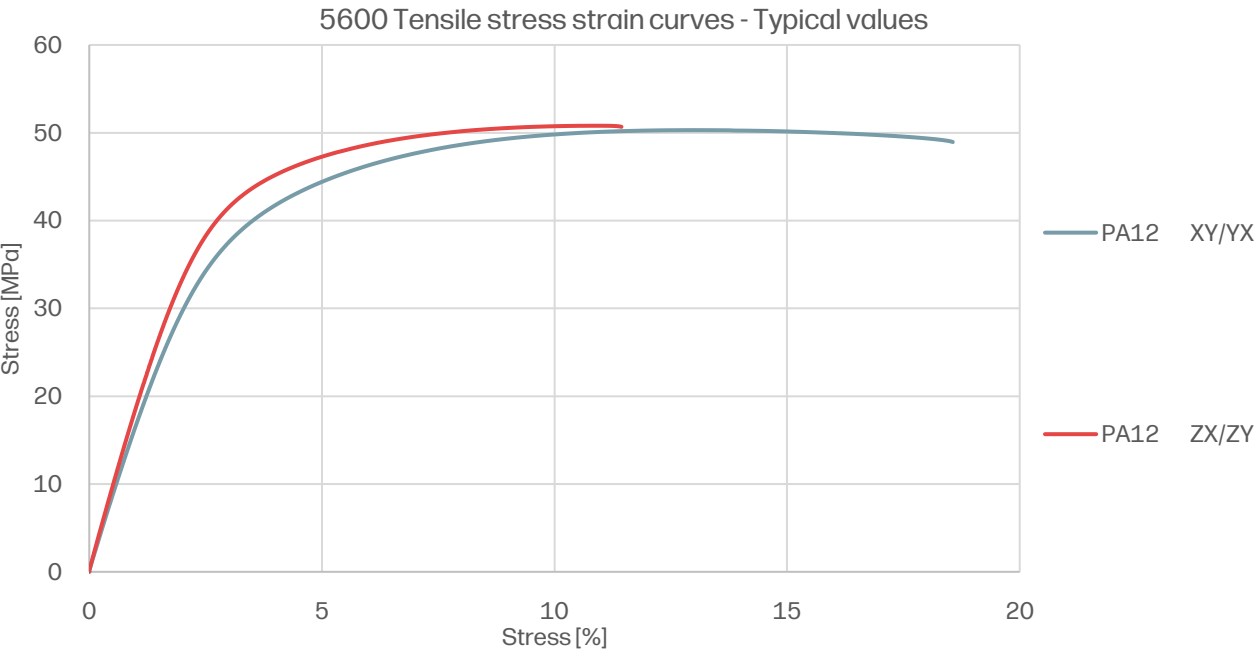
General Part Properties

Property	Method	Units	Mean ±Standard Deviation
Part Density	ASTM D792 Method A	g/cm ³	1.002±0.004
Mean Roughness, Sa, Bottom/Top	ISO 25178-2	MPa	9±0.8
Mean Roughness, Sa, Front/Rear	ISO 25178-2	MPa	12±0.4
Mean Roughness, Sa, Left/Right	ISO 25178-2	MPa	12±0.5
Maximum Surface Height, Sz, Bottom/Top	ISO 25178-2	MPa	210±23
Maximum Surface Height, Sz, Front/Rear	ISO 25178-2	MPa	250±37
Maximum Surface Height, Sz, Left/Right	ISO 25178-2	MPa	260±30
Part Color, L*	ISO/CIE 11664-4		55.4±1.2
Part Color, a*	ISO/CIE 11664-4		-0.4±0.0
Part Color, b*	ISO/CIE 11664-4		-2.0±0.1

Tensiles Type I

(23¹, 55, 90°C) - ASTM D638

Property	Orientation	Units	Mean ±Standard Deviation		
Testing Temperature			23°C ¹	55°C	90°C
Tensile strength, max load	X, Y - (Flatwise)	MPa	50 ±1	36	27
	ZX, ZY - (Vertical)	MPa	51 ±2	37	27
Tensile modulus	X, Y - (Flatwise)	MPa	1750 ±90	800	500
	ZX, ZY - (Vertical)	MPa	1950 ±80	850	550
Elongation at break	X, Y - (Flatwise)	%	19 ±6	48	150
	ZX, ZY - (Vertical)	%	12 ±2	40	60
Elongation at yield	X, Y - (Flatwise)	%	13 ±0.8	20	22
	ZX, ZY - (Vertical)	%	11 ±1.2	20	23
Poisson Ratio	X, Y - (Flatwise)		0.4±0.1		
	ZX, ZY - (Vertical)		0.3±0.04		



 ¹conditioned until water absorption stabilized, 1 month, 23deg 50%RH)

Impact: IZOD

(23°C, 50%HR¹) - ASTM D256 Test Method A

Property	Orientation	Units	Mean ±Standard Deviation
3.2mm - Izod Unnotched	XY, YX (Flatwise)	kJ/m2	41±11
	XZ, YZ (Edgewise)	kJ/m2	42±9
	ZX, ZY (Vertical)	kJ/m2	24±8
3.2mm - Izod Notched	XY, YX (Flatwise)	kJ/m2	4.3±0.4
	XZ, YZ (Edgewise)	kJ/m2	4.7±0.5
	ZX, ZY (Vertical)	kJ/m2	4.2±0.4
10mm - Izod Unnotched	XY, YX (Flatwise)	kJ/m2	41±11
	XZ, YZ (Edgewise)	kJ/m2	42±9
	ZX, ZY (Vertical)	kJ/m2	24±8
10mm - Izod Notched	XY, YX (Flatwise)	kJ/m2	2.6±0.5
	XZ, YZ (Edgewise)	kJ/m2	3.2±0.6
	ZX, ZY (Vertical)	kJ/m2	2.1±0.5

Impact: CHARPY

(23°C, 50%HR¹) - ISO 179-1/1eA

Property	Orientation	Units	Mean ±Standard Deviation
Charpy notched	XY, YX (Flatwise)	kJ/m2	3.3±0.6
	XZ, YZ (Edgewise)	kJ/m2	4.0±0.3
	ZX, ZY (Vertical)	kJ/m2	2.6±0.5
Charpy unnotched	XY, YX (Flatwise)	kJ/m2	49±11
	XZ, YZ (Edgewise)	kJ/m2	46.9±12
	ZX, ZY (Vertical)	kJ/m2	28.4±5

Impact at Temperature:

23°C¹, -20°C, -40°C

Property	Orientation	Units	Mean ±Standard Deviation		
Testing Temperature			23°C ¹	-20°C	-40°C
3.2mm Izod Notched	XY, YX (Flatwise)	kJ/m2	4.3±0.4	3.3	3.5
	XZ, YZ (Edgewise)	kJ/m2	4.7±0.5	3.4	2.9
	ZX, ZY (Vertical)	kJ/m2	4.2±0.4	4.0	3.9
Charpy notched	XY, YX (Flatwise)	kJ/m2	3.3±0.6	2.1	2.5
	XZ, YZ (Edgewise)	kJ/m2	4.0±0.3	2.2	2.3
	ZX, ZY (Vertical)	kJ/m2	2.6±0.5	3.7	3.3

¹conditioned until water absortion stabilized, 1 month, 23deg 50%RH)



Flexural and Compression: ASTM D790

Property	Orientation	Units	Mean ±Standard Deviation
Flexural modulus	XY, YX (Flatwise)	MPa	1750±110
	XZ, YZ (Edgewise)	MPa	1800±95
	ZX, ZY (Vertical)	MPa	1850±105
Flexural strength at 5% Strain	XY, YX (Flatwise)	MPa	63±3.0
	XZ, YZ (Edgewise)	MPa	67±2.3
	ZX, ZY (Vertical)	MPa	68±3.4
Compression Modulus	XY, YX (Flatwise)	MPa	1450±70
	XZ, YZ (Edgewise)	MPa	1500±95
	ZX, ZY (Vertical)	MPa	1450±65
Compression Strength at 10% Strain	XY, YX (Flatwise)	MPa	60±2.1
	XZ, YZ (Edgewise)	MPa	60±2.4
	ZX, ZY (Vertical)	MPa	57±1.7

Hardness and Abrasion

Property	Orientation	Units	Method	Mean ±Standard Deviation
Rockwell - Ball Indentation Hardness (indentator 12.7 mm, 60 kg, Scale R)	X	Rockwell HRM	ASTM D785	99±2.2
	Y			97±2.9
	Z			84±4.2
Hardness Shore D	X, Y, Z		ASTM D2240	73±1.1
Taber Abrasion Loss	X	mg	ASTM D4060	27±4.4
	Y			23±2.4
	Z			23±1.2



Thermo Mechanical Properties

PropertyC	Orientation	Units	Method	Mean ±Standard Deviation
HDT Heat deflection temperature (at 0.455 MPa, 66 psi)	XY, YX (Flatwise)	°C	ASTM D648 Test Method A	175±1.4
	XZ, YZ (Edgewise)			172±3
	ZX, ZY (Vertical)			173±2.2
HDT Heat deflection temperature (at 1.82 MPa, 264 psi)	XY, YX (Flatwise)	°C	ASTM D648 Test Method A	108±4.7
	XZ, YZ (Edgewise)			92±2.8
	ZX, ZY (Vertical)			104±2.9
Vicat softening temperature (at 10N)	XY, YX (Flatwise)	°C	ASTM D1525 Test rate A	175±0.3
	XZ, YZ (Edgewise)			175±0.3
	ZX, ZY (Vertical)			175±1.4
Vicat softening temperature (at 50N)	XY, YX (Flatwise)	°C	ASTM D1525 Test rate A	166±0.7
	XZ, YZ (Edgewise)			164±1.1
	ZX, ZY (Vertical)			163±1.6

Thermal Properties

Property	Units	Method	Mean
Ball pressure (XY & Z)	°C	IEC 60695-10-2	172
Thermal conductivity, XY, XZ, YX, YZ	W/mK	ISO 8302	0.178
Thermal conductivity, ZX, ZY	W/mK	ISO 8302	0.251
Coeff. Thermal expansion lineal α, XY (-30°C to 20°C)	α (1/°K)	ISO 11359-2	105x10-6
Coeff. Thermal expansion lineal α, Z (-30°C to 20°C)	α (1/°K)	ISO 11359-2	97x10-6
Coeff. Thermal expansion lineal α, XY (50°C to 100°C)	α (1/°K)	ISO 11359-2	180x10-6
Coeff. Thermal expansion lineal α, Z (50°C to 100°C)	α (1/°K)	ISO 11359-2	145x10-6



Electrical Properties

Property	Orientation	Units	Method	Mean ±Standard Deviation
Comparative Tracking Index (CTI)	XY	V	ASTM D3638	nd
	Z	V		nd
Comparative Tracking Index (CTI)	XY	V	IEC 60112	nd
	Z	V		nd
Dielectric Strength (conditioning 48h 23°C 50%RH)	XY	kV/mm	ASTM D149	2.8±0.5
	Z	kV/mm		6.2±0.4
Dielectric Strength (conditioning 96h 35°C 90%RH)	XY	kV/mm	ASTM D149	2.8±0.3
	Z	kV/mm		4.1±0.2
Volume Resistivity (23°C 50RH)	XY	Ω cm	ASTM D257	2.70E+14±1.45E+14
	Z	Ω cm		3.66E+14±7.18E+14
Surface Resistivity (23°C 50RH)	XY	Ω	ASTM D257	nd
	Z	Ω		nd

Flammability Properties

Property	Units	Method	Mean ±Standard Deviation
UL-94 Flame class		UL 94	HB (thk. 0.75 mm)
UL-94 Flame class		UL 94	HB (thk. 1.5 mm)
UL-94 Flame class		UL 94	HB (thk. 3.0 mm)
HWI		UL 746A	nd
HWI		UL 746A	nd
HWI		UL 746A	nd
HWI		UL 746A	nd
HAI		UL 746A	nd
HAI		UL 746A	nd
HAI		UL 746A	nd
RTI	°C	UL 746B	65
GWFI (Glow wire flammability index)	°C	IEC 60695-2-12	775 (thk. 0.75 mm)
GWFI (Glow wire flammability index)	°C	IEC 60695-2-12	700 (thk. 1.5 mm)
GWFI (Glow wire flammability index)	°C	IEC 60695-2-12	700 (thk. 3.0 mm)
GWIT (Glow wire ignition temperature)	°C	IEC 60695-2-13	725



Material General Properties

Property	Units	Method	Mean ±Standard Deviation
Reuse Ratio	%	-	80%
Powder melting point (DSC)	°C / °F	ASTM D3418	187 / 369
Powder Crystallization point (DSC)	°C / °F		
Particle size (D50)	µm	ASTM D3451	60
Bulk density of powder	g/cm2 / lb/in3	ASTM D1895	0.425 / 0.015

Material Safety Datahseet *

Product Number	Material
V1R20A	HP 3D HR PA 12 1400L /600 kg Material
V1R16A	HP 3D HR PA 12 300L/130 kg Material
V1R34A	HP 3D HR PA 12 300L/130 kg P Material

* The link provided refers to US English versión of the Safety Datasheet

Other country specific Material Safety Datasheets are available [here](#)



Testing Considerations

Testing was performed for the HP 3D HR PA12, enabled by Evonik in the HP Jet Fusion 5600 Series 3D Printing Solutions with the Balanced print profile using a 80% refresh ratio.

Based on HP internal testing and using the following print Jobs: PQ PQ Extended Datasheet, PQ_ED_Tensile_at_temperature_v1, PQ_ED_External_Test_v1, PQ_ED_Flexural_Fatigue_v1, PQ_ED_Impact_at_temperature_v1, PQ_ED_Tensile_at_temperature_v1, PQ_ED_Tensile_creep_v1

The printed parts nomenclature for orientations is defined following the ASTM F2971

Printed parts were conditioned prior to measurements following the ISO 52924.
Environmental Conditions (All Tests): 23 °C, 50% RH

Dimensions measured using round-tip micrometers except for: Compression cylinder diameter: caliper and Impact specimen width: notch Depth digital gauge

The following standards were used for each of the tests conducted for the different specimens. Additional conditions listed reflect test parameters not defined by the standards but that can influence results.

Sub-Category	Method
Part Density	ASTM D792 Method A
Part Roughness Measurements on all 6 faces of 40 mm cubes	ISO 25178-2
Part Color Measurements on all 6 faces of 40 mm cubes	ISO/CIE 11664-4
Tensile Crosshead speed: 50 mm/min, Modulus: regression 0.05–0.25% strain, Strain measured using automatic extensometer (full test)	ASTM D638 Type I / ISO 527 Type 1A
Flexural Test rate: 13.55 mm/min, Modulus: regression 0.05–0.25% strain, Deflection measured via deflectometer	ASTM D790 Procedure B
Charpy impact	ISO 179-1/1eA (notched) ISO 179-1/1eU (unnotched)
Izod Impact	ASTM D256 (notched), ASTM D4812 (unnotched)
Compression Test rate: 1.3 mm/min, Specimens: 12.7 mm Ø × 50.8 mm (modulus) and 12.7 mm Ø × 25.4 mm (strength), Modulus window: 0.5–1.0% strain, Strain measured via optical extensometer	ASTM D695 / ISO 604
Rockwell – Ball Indentation Hardness	ASTM D785 / ISO 2039-2 , Scale R, 12.7 mm indenter, 60 kg load
Shore Hardness D	ASTM D2240 / ISO 868
Creep	ASTM D2990
Flexural Fatigue	ASTM D7774
Taber Abrasion Loss 1000 cycles, Calibrase® CS-10 wheels, refaced with S-11 discs, Vacuum & wheel cleaning per manufacturer recommendations (affects wear rate)	ASTM D4060
Comparative Tracking Index (CTI)	ASTM D3638 / IEC 60112
Dielectric Strength	ASTM D149
Volume and Surface Resistivity	ASTM D257
Heat deflection temperature (HDT)	ASTM D648, Method A
Vicat softening temperature	ASTM D1525 Test rate A / ISO 306
Thermal conductivity	ISO 8302 / ISO 306
Coeff. Thermal expansion lineal α	ISO 11359-2
Ball pressure	IEC 60695

