

PPA-CF

CARBON-FIBER-REINFORCED HIGH-TEMPERATURE ENGINEERING NYLON

PPA-CF is a carbon-fiber-reinforced, semi-aromatic nylon engineered for exceptional stiffness, strength, dimensional stability, and thermal performance. It is suited to demanding functional prototypes and end-use parts operating in humid or elevated-temperature environments.

Design Advantages

- Very high X/Y stiffness and tensile strength for structural components
- High heat-deflection and softening temperatures for demanding service
- Improved moisture performance compared with general-purpose nylons
- Broad resistance to weak acids, weak alkalis, solvents, oils, and greases

Material Specifications

ITEM	PUBLISHED VALUE
Material family	Semi-aromatic nylon with carbon fiber
Filament diameter	1.75 +/- 0.05 mm
Published density	1.25 g/cm ³
Vicat softening temperature	232 C
Heat deflection temperature	196 C at 1.8 MPa; 227 C at 0.45 MPa
Water solubility	Insoluble

Recommended Processing Window

SETTING	RECOMMENDED RANGE
Drying before printing	Forced-air drying oven at 100 to 140 C for 8 to 12 h
Printing and storage humidity	Below 20% RH; sealed with desiccant
Nozzle temperature	280 to 310 C
Build surface	Smooth or textured PEI surface with suitable adhesive
Bed temperature	100 to 120 C
Cooling fan	On; tune for geometry and layer bonding
Printing speed	Below 100 mm/s
Chamber temperature	50 to 80 C

Physical and Thermal Properties

PROPERTY	TEST METHOD	PUBLISHED VALUE
Density	ISO 1183	1.25 g/cm ³
Melt index	280 C at 2.16 kg	8.4 +/- 0.7 g/10 min
Melting temperature	DSC at 10 C/min	258 C
Glass transition temperature	DSC at 10 C/min	85 C
Crystallization temperature	DSC at 10 C/min	178 C
Vicat softening temperature	ISO 306 and GB/T 1633	232 C
Heat deflection at 1.8 MPa	ISO 75	196 C
Heat deflection at 0.45 MPa	ISO 75	227 C
Saturated water absorption	25 C and 55% RH	1.30%

Mechanical Properties

PROPERTY	TEST METHOD	PUBLISHED VALUE
Young's modulus X Y	ISO 527 and GB/T 1040	11,800 +/- 670 MPa
Young's modulus Z	ISO 527 and GB/T 1040	4,300 +/- 340 MPa
Tensile strength X Y	ISO 527 and GB/T 1040	168 +/- 4 MPa
Tensile strength Z	ISO 527 and GB/T 1040	57 +/- 5 MPa
Elongation at break X Y	ISO 527 and GB/T 1040	3.2 +/- 0.4%
Elongation at break Z	ISO 527 and GB/T 1040	0.9 +/- 0.2%
Flexural modulus X Y	ISO 178 and GB/T 9341	9,860 +/- 480 MPa
Flexural modulus Z	ISO 178 and GB/T 9341	3,240 +/- 360 MPa
Flexural strength X Y	ISO 178 and GB/T 9341	208 +/- 6 MPa
Flexural strength Z	ISO 178 and GB/T 9341	63 +/- 4 MPa
Impact strength X Y	ISO 179 and GB/T 1043	41.7 +/- 2.8 kJ/m ² ; notched 6.5 +/- 2.3 kJ/m ²
Impact strength Z	ISO 179 and GB/T 1043	4.3 +/- 0.4 kJ/m ²

Representative values from standardized printed specimens. Actual part performance depends on geometry, orientation, wall thickness, moisture condition, processing parameters, and service environment.

Chemical and Handling Characteristics

CHARACTERISTIC	PUBLISHED INFORMATION
Composition	Semi-aromatic nylon with carbon fiber
Chemical stability	Stable under normal storage and handling conditions
Water solubility	Insoluble
Acid and alkali resistance	Resistant to weak acids and alkalis; not resistant to strong acids or alkalis
Organic solvent resistance	Resistant to most organic solvents
Oil and grease resistance	Resistant to most oils and greases
Flammability	Flammable
Combustion products	Water, carbon oxides, and nitrogen oxides; pungent odor

Representative Specimen Conditions

PARAMETER	SOURCE CONDITION
Nozzle temperature	290 C
Bed temperature	110 C
Printing speed	80 mm/s
Chamber temperature	52 C
Pre-test conditioning	Specimens were not annealed before testing

Design and Validation Considerations

- Design for anisotropy: published strength, elongation, and impact performance are lower in the Z direction than in X/Y.
- Use X/Y-oriented load paths where maximum strength, ductility, and impact performance are important.
- Dry and store material below 20% RH with desiccant; moisture can affect extrusion quality and finished-part performance.
- Higher chamber temperature can improve properties, especially in Z; validate the selected process window.
- Annealing at 120 to 140 C for 6 to 12 h may change properties and can reduce toughness or cause deformation; validate the specific geometry and process.
- Confirm chemical compatibility, sustained-temperature behavior, creep, flammability, and safety-critical loads in the intended service environment.

Published Data and Qualification

The values in this sheet are based on standardized specimen testing documented by the material source and are provided for design reference and material comparison. Lucent Additive has not independently generated every published value. Final-part performance can differ because of geometry, orientation, processing, moisture conditioning, and service environment. This document does not create a material warranty or replace qualification of the customer's finished component.

Start an Application Review

Send Lucent Additive your CAD model, quantity, load conditions, operating temperature, inspection needs, chemical exposure, and target schedule. Our team can review material fit, build orientation, production strategy, and validation needs before quoting.

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