Raise3D Industrial PA12 CF+ Technical Data Sheet

Raise3D Industrial PA12 CF+ is a carbon fiber-reinforced composite filament based on Polyamide 612 (PA612, Nylon 612). PA612 inherits the best characteristics of both PA6 and PA12, such as toughness and less water absorption. By adding 15 wt.% short carbon fibers with optimized length distribution, mechanical, thermal properties and even surface quality of printed part are all enhanced.

Compared with Raise3D Industrial PA12 CF, it exhibits higher strength-to-weight ratio, better interlayer bonding quality (Z-direction strength) and better dimensional stability. After annealing, thermal and mechanical properties are improved further. PA12CF+ is an optimal choice for lightweight and strong end-use applications, such as jigs. fixtures, and many other functional parts in manufacturing, automotive, and aerospace fields.

Filament Specifications

Property	Testing Method	Typical Value
Density (g/cm^3 at 23 °C)	ISO 1183, GB/T 1033	1.03
Heat Deflection Temperature (°C) (value before annealing)	ISO75 1.8MPa ISO75 0.45 MPa	103 (90) 142 (110)
Melt index (g/10 min)	260 °C, 2.16 kg	9.91
Odor	/	Almost odorless
Solubility	/	Insoluble in water

Mechanical Properties (As printed, conditioned)

Property	Testing Method	Typical value
Young's modulus (X-Y)	ISO 527, GB/T 1040	3500 ± 50 MPa
Young's modulus (Z)	ISO 527, GB/T 1040	1600 ± 50 MPa
Tensile strength (X-Y)	ISO 52 7, GB/T 1040	68 ± 1 MPa
Tensile strength (Z)	ISO 527, GB/T 1040	34.7 ± 2.1 MPa
Elongation at break (X-Y)	ISO 527, GB/T 1040	3.5 ± 0.1 %
Elongation at break (Z)	ISO 527, GB/T 1040	1.7 ± 0.2 %
Bending modulus (X-Y)	ISO 178, GB/T 9341	3600 ± 70 MPa

Bending strength (X-Y)	ISO 178, GB/T 9341	98 ± 5 MPa
Charpy impact strength (X-Y)	ISO 179, GB/T 1043	8.6 ± 0.4 kJ/m^2

All specimens were immerged in ambient temperature for 3 days prior totesting.

Mechanical Properties (After annealing, dry state)

Property	Testing Method	Typical value
Young's modulus (X-Y)	ISO 527, GB/T 1040	4736 ± 88 MPa
Young's modulus (Z)	ISO 527, GB/T 1040	2086 ± 92 MPa
Tensile strength (X-Y)	ISO 52 7, GB/T1040	86 ± 1 MPa
Tensile strength (Z)	ISO 527, GB/T 1040	44.7 ± 2.1 MPa
Elongation at break (X-Y)	ISO 527, GB/T 1040	2.8 ± 0.1 %
Elongation at break (Z)	ISO 527, GB/T 1040	1.9 ± 0.2 %
Bending modulus (X-Y)	ISO 178, GB/T 9341	4331 ± 90 MPa
Bending strength (X-Y)	ISO 178, GB/T 9341	125 ± 3 MPa
Charpy impact strength (X-Y)	ISO 179, GB/T 1043	6.9 ± 0.3 kJ/m^2

All specimens were annealed at 80˚C for 12h and dried for 48h prior to testing.

Mechanical Properties (After annealing, conditioned)

Property	Testing Method	Typical value
Young's modulus (X-Y)	ISO 527, GB/T 1040	4626 ± 163 MPa
Young's modulus (Z)	ISO 527, GB/T 1040	2074 ± 91 MPa
Tensile strength (X-Y)	ISO 527, GB/T 1040	81 ± 2 MPa
Tensile strength (Z)	ISO 527, GB/T 1040	44.9 ± 1.8 MPa

Elongation at break (X-Y)	ISO 527, GB/T 1040	3.8 ± 0.3 %
Elongation at break (Z)	ISO 527, GB/T 1040	2.2 ± 0.4 %
Bending modulus (X-Y)	ISO 178, GB/T 9341	4305 ± 90 MPa
Bending strength (X-Y)	ISO 178, GB/T 9341	117 ± 2 MPa
Charpy impact strength (X-Y)	ISO 179, GB/T 1043	7.2 ± 0.3 kJ/m^2

All specimens were annealed at 80 °C for 12h, and immerged in ambient temperature for 3 days prior to testing.

Note：

1. Dry PA12 CF+ at 80°C for 12 hours before printing, moisture content is crucial for final printed partquality.
2. After drying, we recommend to store PA12 CF+ filaments into Raise3D Filaments Dry Box during theprinting.
3. Abrasion of the brass nozzle happens frequently when printing PA12 CF+. Using abrasion resistance nozzle, such as hardened steel and ruby nozzle, is highly recommended.
4. After the printing, it is recommended to anneal the model in the oven at 80-100°C for 8-12 hours.
5. For a small size model (side length <50 mm), annealing at 80°C for 8 hours is recommended; For a medium-size model (50mm<side length <150 mm), annealing at 80°C for 12 hours is recommended; For a large size model, 100°C for at least 12 hours is recommended.
6. After annealing, max. 0.4%-dimensional shrinkage could be observed in Z-axis depending on infill and layer height, no significant dimensional shrinkage in XY-axis.
7. If PA12 CF+ is used as the support material for itself, please remove the support structure after annealing.

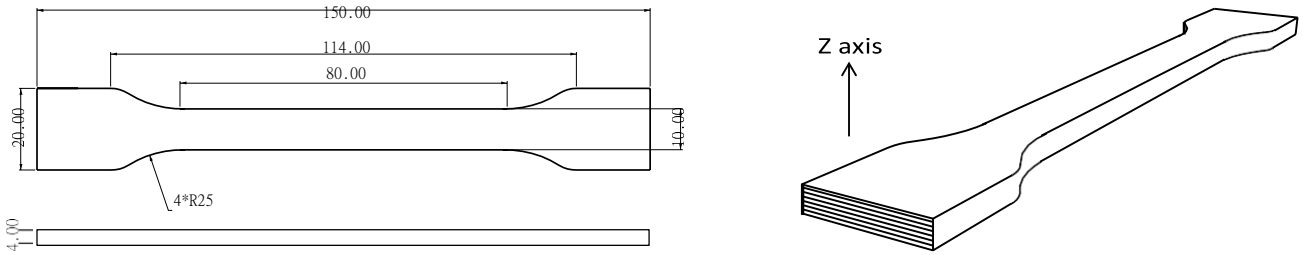

Fig 1. Tensile testing specimen

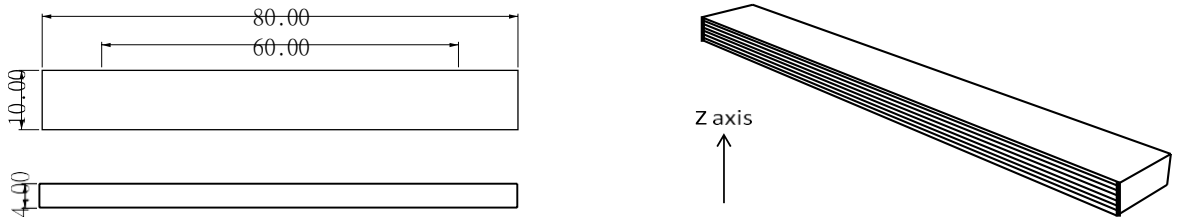

Fig 2. Flexural testing specimen

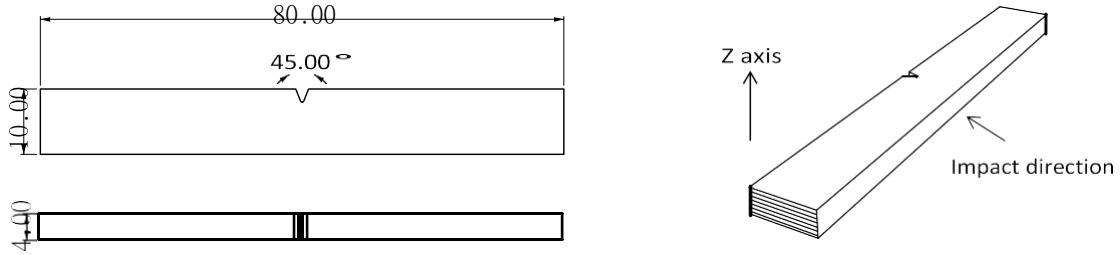

Fig 3. Impact testing specimen

Disclaimer

The typical values presented in this data sheet are intended for reference and comparison purposes only. They should not be used for design specifications or quality control purposes. Actual values may vary significantly with printing conditions. End-use performance of printed parts depends not only on materials, but also on part design, environmental conditions, printing conditions, etc. Product specifications are subject to change without notice.

Each user is responsible for determining the safety, lawfulness, technical suitability, and disposal/recycling practices of Raise3D materials for the intended application. Raise3D makes no warranty of any kind, unless announced separately, to the fitness for any particular use or application. Raise3D shall not be made liable for any damage, injury or loss induced from the use of Raise3D materials in any particular application.