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Innovators in 3D printing

Technical Data Sheet

PolyMide™ PA612-CF

www.polymaker.com

V5.4

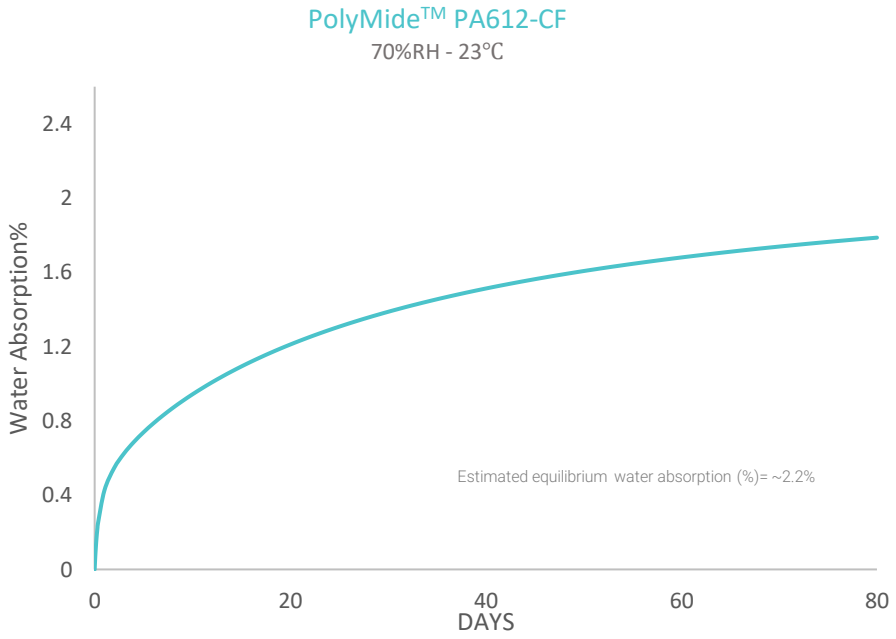
PolyMide™
PA612-CF

PolyMide™ PA612-CF is a carbon fiber reinforced long chain copolyimide filament. Thanks to its chemical structure, this product has lower moisture sensitivity compared to PA6/66 and PA6-based materials, and better mechanical properties than PA12-based materials. In addition, the carbon fiber reinforcement and Warp-free™ technology enhance the size stability of the prints produced with this material.

PHYSICAL PROPERTIES

Property	Testing Method	Typical Value
Density	ISO1183, GB/T1033	1.03 g/cm^3 at 23°C
Melt index	260°C, 2.16 kg	9.91 g/10min

MOISTURE ABSORPTION CURVE



Note:
PolyMide™ PA612-CF absorbs moisture slowly over time. The estimated equilibrium water absorption is around 2.2%.

THERMAL PROPERTIES

Property	Testing Method	Typical Value
Glass transition temperature	DSC, 10°C/min	N/A
Melting temperature	DSC, 10°C/min	210 °C
Crystallization temperature	DSC, 10°C/min	180 °C
Decomposition temperature	TGA, 20°C/min	N/A
Vicat softening temperature	ISO 306, GB/T 1633	N/A
Heat deflection temperature	ISO 75 1.8MPa	114 °C
Heat deflection temperature	ISO 75 0.45MPa	175 °C

MECHANICAL PROPERTIES (Dry Status)

Property	Testing Method	Typical Value
Young's modulus (X-Y)	ISO 527, GB/T 1040	5137 ± 192 MPa
Young's modulus (Z)		2786 ± 78 MPa
Tensile strength (X-Y)	ISO 527, GB/T 1040	91.9 ± 2.0 MPa
Tensile strength (Z)		48.3 ± 3.9 MPa
Elongation at break (X-Y)	ISO 527, GB/T 1040	2.6 ± 0.2 %
Elongation at break (Z)		2.1 ± 0.2 %
Bending modulus (X-Y)	ISO 178, GB/T 9341	4583 ± 63 MPa
Bending modulus (Z)		NA
Bending strength (X-Y)	ISO 178, GB/T 9341	138.0 ± 2.2 MPa
Bending strength (Z)		NA
Notched Charpy impact strength (X-Y)	ISO 179, GB/T 1043	8.1 ± 0.8 kJ/m2
Notched Charpy impact strength (Z)		NA

Note:

1. All specimens were annealed at 100˚C for 15h and dried for 48h prior to testing.
2. All specimens were printed on Raise 3D E2-CF and sliced on IdeaMaker, the printing settings are shown below. All data here is only for reference purposes, the mechanical properties of printed parts are depending on printers, printing settings and the thermal history of each printed layer.

MECHANICAL PROPERTIES (Wet Status)

Property	Testing Method	Typical Value
Young's modulus (X-Y)	ISO 527, GB/T 1040	3991 ± 136 MPa
Young's modulus (Z)		2387 ± 150 MPa
Tensile strength (X-Y)	ISO 527, GB/T 1040	83.1 ± 2.2 MPa
Tensile strength (Z)		35.6 ± 3.0 MPa
Elongation at break (X-Y)	ISO 527, GB/T 1040	4.1 ± 0.3 %
Elongation at break (Z)		1.7 ± 0.2 %
Bending modulus (X-Y)	ISO 178, GB/T 934	3888 ± 56 MPa
Bending modulus (Z)		NA
Bending strength (X-Y)	ISO 178, GB/T 934	118 ± 1.6 MPa
Bending strength (Z)		NA
Notched Charpy impact strength (X-Y)	ISO 179, GB/T 1043	7.7 ± 0.5 kJ/m2
Notched Charpy impact strength (Z)		NA

Note:

1. All specimens were printed on Raise 3D E2-CF and sliced on IdeaMaker, the printing settings are shown below. All data here is only for reference purposes, the mechanical properties of printed parts are depending on printers, printing settings and the thermal history of each printed layer.
2. All specimens were annealed at 100℃ for 15h, and immerged in water at 60℃ for 48h prior to testing. The average moisture content of specimens is 0.03%.

RECOMMENDED PRINTING CONDITIONS

Parameter	
Nozzle temperature	250 – 300 (℃)
Build surface treatment	PC and Texture PEI (Glue when needed)
Build plate temperature	25 - 50 (˚C)
Cooling fan	OFF
Printing speed	50 - 300 (mm/s)
Retraction distance	3 - 6 (mm)
Retraction speed	40 - 60 (mm/s)
Closure Chamber	Needed (ambient temperature)
Recommended support material	PolySupport™ for PA12
Drying setting	100˚C for 8h
Annealing setting	80˚C for 6 h

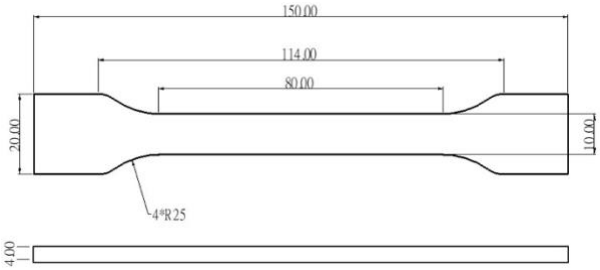
* Based on 0.4 mm nozzle. Printing conditions may vary with different nozzle diameters

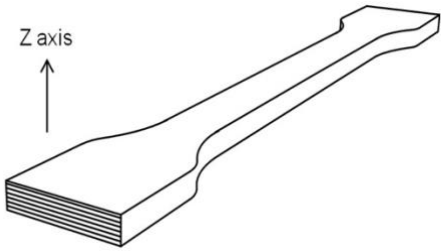
Note:

- Abrasion of the brass nozzle happens frequently when printing PolyMide™ PA612-CF. Normally, the life of a brass nozzle would be approximately 9h. A wear-resistance nozzle, such as hardened metal coated brass nozzle, for example, nickel coated brass nozzle, metal hardened steel and ruby nozzle, is highly recommended to be used with PolyMide™ PA612-CF.
- If printing PolyMide™ PA612-CF on a general desktop 3d printer at 250-260℃, it is highly recommended to use a hardened metal-coated brass nozzle, for example, a nickel-coated brass nozzle.
- If PolyMide™ PA612-CF is used as the support material for itself, please remove the support structure before excessive moisture absorption. Otherwise, the support structure can be permanently bonded to the model.
- After the printing process, it is recommended to anneal the model in the oven at 80°C for 6 hours.

TENSILE TESTING SPECIMEN

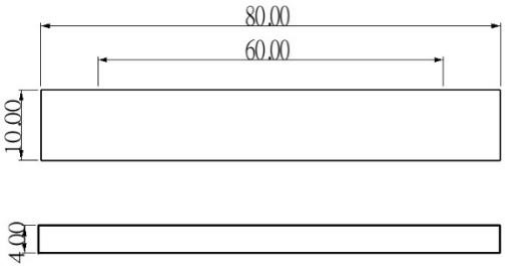
ISO 527, GB/T 1040

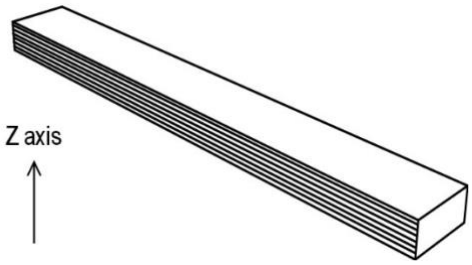




FLEXURAL TESTING SPECIMEN

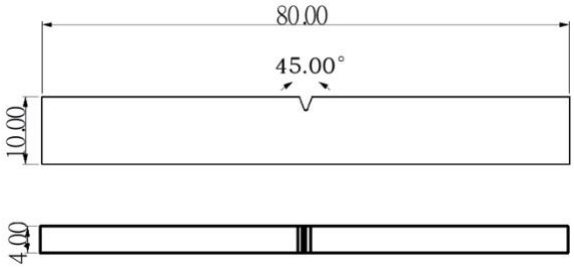
ISO 178, GB/T 9341

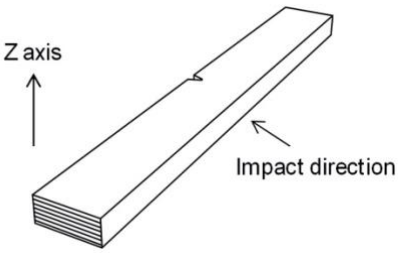




IMPACT TESTING SPECIMEN

ISO 179, GB/T 1043





HOW TO MAKE SPECIMENS

Printing temperature	290 °C
Bed temperature	50 °C
Shell	2
Top & bottom layer	3
Infill	100%
Environmental temperature	Ambient temperature
Cooling fan	OFF

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 Polymaker materials for the intended application. Polymaker makes no warranty of any kind, unless announced separately, to the fitness for any use or application. Polymaker shall not be made liable for any damage, injury or loss induced from the use of Polymaker materials in any application.