PolyCore ABS-5022

Technical Data Sheet (Ver. 2.0, last updated: Dec, 2023)

PolyCore™ ABS-5022 is 20% carbon fiber reinforced ABS pellet with strong mechanical properties, great dimensional stability, good durability and high thermal conductivity with relatively low CTE. It is suitable for applications where durability & thermal resistance matters, for example, marine prototype and low-to-medium temperature composite tooling (<80°C).

Basic Properties

Property	Testing Method	Typical Value
Density (g/cm^3 at 21.5 °C)	ASTM D792 (ISO 1183, GB/T 1033)	1.20
Melt index (g/10 min)	220 °C, 10 kg	11
Glass transition temperature (°C)	DSC, 10 °C/min	101
Vicat Softening temperature (°C)	ASTM D1525 (ISO 306 GB/T 1633)	113
Heat Deflection Temperature (°C)	ISO 75 1.8MPa 0.45MPa	98 102

Mechanical Properties1

Property	Testing Method	Typical Value
Young's modulus (MPa)	ASTM D638 (ISO 527, GB/T 1040)	11515 ± 224
Tensile strength (MPa)	ASTM D638 (ISO527, GB/T 1040)	132.2 ± 2.0
Elongation at break (%)	ASTM D638 (ISO527, GB/T 1040)	2.2 ± 0.2
Bending modulus (MPa)	ASTM D790 (ISO 178, GB/T 9341)	9574 ± 277
Bending strength (MPa)	ASTM D790 (ISO 178, GB/T 9341)	185.7 ± 3.8

1. Tested with injection molding specimens

Mechanical Properties1

Property	Testing Method	Typical Value
Young's modulus (MPa) (X-Y)	ASTM D638 (ISO 527, GB/T 1040)	8093 ±1457
Tensile strength (MPa) (X-Y)	ASTM D638 (ISO527, GB/T 1040)	90 ± 3.0
Elongation at break (%) (X-Y)	ASTM D638 (ISO527, GB/T 1040)	0.7±0.2
Bending modulus (MPa) (X-Y)	ASTM D790 (ISO 178, GB/T 9341)	9742.4 ± 542

Bending strength (MPa) (X-Y)	ASTM D790 (ISO 178, GB/T 9341)	128.7 ± 9.4
Charpy Impact strength (kJ/m^2) (X-Y)	ASTM D256 (ISO 179, GB/T 1043)	47±4.6
Young's modulus (MPa) (Z)	ASTM D638 (ISO 527, GB/T 1040)	2909 ± 21
Tensile strength (MPa) (Z)	ASTM D638 (ISO527, GB/T 1040)	21.7± 1.1
Elongation at break (%) (Z)	ASTM D638 (ISO527, GB/T 1040)	0.9 ± 0.1
Bending modulus (MPa) (Z)	ASTM D790 (ISO 178, GB/T 9341)	2371.6 ± 194
Bending strength (MPa) (Z)	ASTM D790 (ISO 178, GB/T 9341)	20.5 ± 1.7
Charpy Impact strength (kJ/m^2) (Z)	ASTM D256 (ISO 179, GB/T 1043)	20.9 ± 2.5

1. Tested with the specimens printed under following conditions:
Nozzle temperature = 250°C, Nozzle diameter: 8mm, Shell width = 14mm, Layer height = 3mm, Layer time = 62s,
Room temperature = 15°C ,100% solid specimens.

Recommended Printing Conditions

Parameter	Recommended Setting
Drying temperature (°C)	80
Drying Time (h)	3 – 4
Maximum moisture content (%)	0.02
Barrel – zone 1 temperature (°C)	210 - 220
Barrel – zone 2 temperature (°C)	220 - 240
Barrel – zone 3 temperature (°C)	230 - 250
Nozzle temperature (°C)	230 - 240
Bed temperature (°C)	40 - 80

Other Comments

- It is recommended to stop feeding and continue extruding until the extruder is fully empty, if the printing stops in a short term, such as 10-30 min.
- It is recommended to stop feeding and continue extruding until the extruder is fully empty, then use polyethylene (PE) to clean the extruder, if the printing stop in a long term, such as several hours. It is helpful to avoid the carbonization of material and keep extruder working in a good condition

Recommended Printing Parameters

	Tr = 40℃ Width=22mm Height=3mm	Tr = 40℃ Width=16mm Height=3mm	Tr = 40℃ Width=5mm Height=2mm	Tr = 25℃ Width=22mm Height=3mm	Tr = 25℃ Width=16mm Height=3mm	Tr = 25℃ Width=5mm Height=2mm	Tr = 10℃ Width=22mm Height=3mm	Tr = 10℃ Width=16mm Height=3mm	Tr = 10℃ Width=5mm Height=2mm
Top layer Temperature	Layer Time (s)	Layer Time (s)	Layer Time (s)	Layer Time (s)	Layer Time (s)	Layer Time (s)	Layer Time (s)	Layer Time (s)	Layer Time (s)
180 ℃	42	41	27	38	36	21	30	28	17
170 ℃	53	51	35	47	45	28	39	38	22
160 ℃	66	64	47	58	56	37	50	51	30
150 ℃	83	80	62	72	69	49	63	62	39
140 ℃	104	101	83	89	87	66	80	76	52
130 ℃	131	126	110	110	108	88	101	92	69
120 ℃	164	158	145	136	134	116	120	111	92
110 ℃	205	199	193	168	165	155	145	131	122
100 ℃	258	249	236	207	199	186	200	172	161
90 ℃	324	313	300	256	241	234	257	231	214

1：Definition of each concept

- Layer time: the time spent for depositing one layer of the printed part.
- Top layer temperature: the instantaneous temperature of a specific point on the topmost completed layer, measured when the nozzle printing the current layer is positioned directly above it.
- Width: the cross-sectional dimension of the printed layer, perpendicular to the direction of the print nozzle's movement.
- Height: the vertical dimension of the printed object, or the layer thickness during pellet printing.
- Tr: room temperature when starting pellet printing.

2： The top layer temperature should range between the material's glass transition temperature (Tg) and its non-collapse printing temperature for optimal mechanical properties and dimensional stability.

3：Above data is inferred based on a melt temperature of 230°C at nozzle exit and a 1m*1m*1m square frame model.

4：The simulation condition is based on a closed room without additional air disturbances, and assumes some environment temperature increasement.

5：Above data is inferred based on the thermal history simulation software, Dragon, by Helio Additive. It should be used for reference only. For a more detailed analysis, please contact Polymaker.

Disclaimer