FusRock® FDM Printing Material
Technical Data Sheet

Data / Revised: 07.2023 Version No: 5.0

FusForce™ PC-FR

阻燃 PC 3D 打印材料

Flame Retardant Polycarbonate 3D Printing Filament

产品亮点
Product highlights

- **无卤阻燃**

  FusForce™ PC-FR 是一款优秀的防火材料，以聚碳酸酯为基材，通过添加磷系阻燃剂，使 PC 具有优秀的自熄性能，阻燃等级可达 UL94 V-0 级（0.8mm）。相比于添加卤素阻燃剂的材料，FusForce™ PC-FR 燃烧后不会释放大量烟雾和有毒气体，更加安全环保，同时仍然保留了聚碳酸酯优秀的机械性能和耐热性。

- Halogen-free flame retardants

  FusForce™ PC-FR is an excellent flame-resistant material which is based on polycarbonate. By adding phosphorus flame retardant, PC has excellent self-extinguishing performance, and the flame-retardant grade can reach UL94 V-0 level (0.8mm). Compared with materials with halogen flame retardants, FusForce™ PC-FR will not release much smoke and toxic gases after burning. Therefore, FusForce™ PC-FR is safer and more environmentally friendly, while still maintaining the excellent mechanical properties and heat resistance of polycarbonate.

产品详情
Product details

颜色 Color：黑色 Black

线径 Diameter：1.75mm

净重 Net Weight：500g，1kg，2.5kg

物性表（v1.0）

Material Properties

测试项目 Property	测试方法 Test Method	典型值 Typical Value	
密度 Density	ISO 1183	1.19 g/cm³	
玻璃化转变温度 Glass transition temperature	ISO 11357	115°C	
熔融指数 Melt index	250°C，2.16kg	12 g/10min	
		未退火 Unannealed	90°C 退火 4h Annealed at 90°C for 4h
热变形温度（X-Y） Heat deflection temperature (X-Y)	ISO 75：Method A ISO 75：Method B	102°C (1.8MPa) 107°C (0.45MPa)	106°C (1.8MPa) 110°C (0.45MPa)
拉伸屈服强度（X-Y） Tensile yield strength (X-Y)	ISO 527	58.09±0.68 MPa	61.50±0.66 MPa
屈服点伸长率（X-Y） Elongation at Yield (X-Y)		4.30±0.07 %	4.07±0.08 %
杨氏模量（X-Y） Young's modulus (X-Y)		2532.29±85.81 MPa	2754.86±61.29 MPa
拉伸断裂强度（X-Y） Tensile breaking strength (X-Y)		50.28±0.94 MPa	58.65±1.17 MPa
断裂伸长率（X-Y） Elongation at break (X-Y)		7.06±1.49 %	5.06±0.75 %
拉伸断裂强度（Z） Tensile breaking strength (Z)	ISO 527	50.39±1.91 MPa	50.10±1.62 MPa
杨氏模量（Z） Young's modulus (Z)		2649.30±145.33 MPa	2462.30±224.55 MPa
断裂伸长率（Z） Elongation at break (Z)		2.65±0.21 %	2.82±0.20 %
弯曲强度（X-Y） Bending strength (Z)	ISO 178	83.99±0.76 MPa	90.73±0.35 MPa

弯曲模量（X-Y） Bending modulus (X-Y)		1906.71±78.22 MPa	1857.86±128.77 MPa
缺口冲击强度（X-Y） Charpy impact strength (X-Y)	ISO 179	13.43±1.26 kJ/㎡	9.49±0.76 kJ/㎡
UL 阻燃等级 UL Flame-retardant Grade			
0.4mm 厚度 0.4mm thickness	UL94	V-2	
0.8mm 厚度 0.8mm thickness		V-0	
2.0mm 厚度 2.0mm thickness		5VB	

试样打印参数：喷嘴大小 0.4mm，喷嘴温度 255°C，底板加热 110°C，腔体温度 55℃，打印速度 50mm/s，填充率 100%，填充角度±45°

退火条件：90℃，退火 4 小时

Specimens printed under the following conditions: Nozzle size 0.4mm, Nozzle temp 255°C, Bed temp 110°C, Chamber temp 55°C, Printing speed 50mm/s, Infill 100%, Infill angle ±45°.

Annealing conditions: The specimens were annealed at 90°Cfor 4h.

建议打印参数

Recommended printing conditions

喷头温度 Nozzle temperature	250-270°C
建议喷嘴大小 Recommended Nozzle diameter	≥0.2mm
建议底板材质 Recommended build surface treatment	PEI 底板 PEI Film
底板温度 Build plate temperature	110-120°C
腔体温度 Chamber temperature	80-100°C
Raft 间距 Raft separation distance	0.16-0.18 mm

冷却风扇 Cooling fan speed	Off
打印速度 Printing speed	30-120 mm/s
回抽距离 Retraction distance	1-3 mm
回抽速度 Retraction speed	1800-3600 mm/min

其他建议：

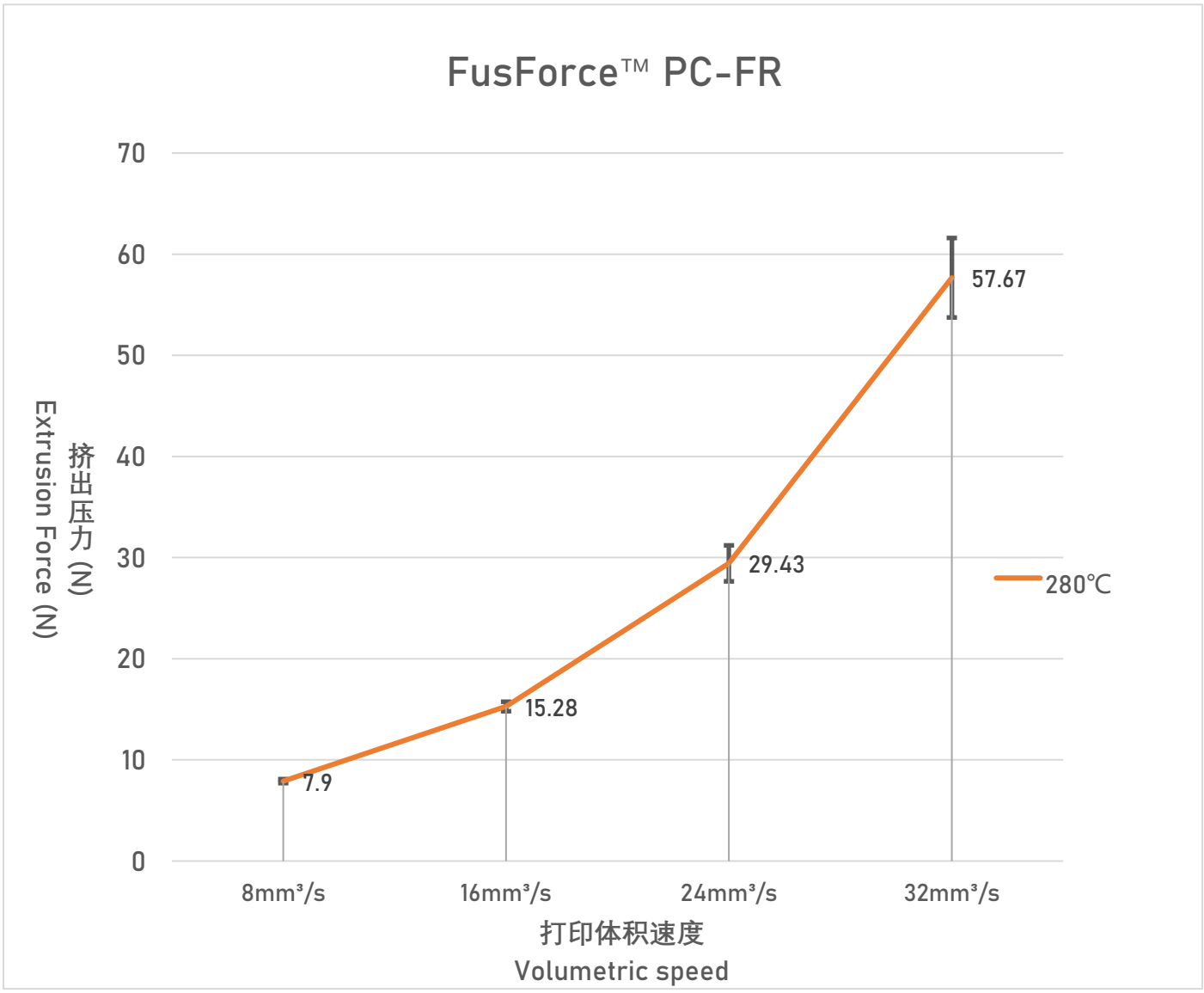
1. PC 打印温度较高，对水分较敏感，在打印过程中将线材放入干燥盒内，相对湿度控制在 15%以下，可有效减少拉丝、表面粗糙等现象。如果耗材已吸潮，可以使用烘箱在 100-110℃进行 4 小时的烘干处理。
2. 使用 PC 打印的模型在 90℃环境下退火 4h，可有效释放内应力，延长使用寿命。

Additional suggestions：

1. PC filament is sensitive to moisture and can easily have stringing during printing. To reduce the stringing and surface roughness effectively, keep your filament in a dry box and control relative humidity to below 15%. If the filament has absorbed moisture already, dry the filament in an oven at 100-110°C for 4 hours.
2. It is recommended to anneal models printed with PC at 90℃ for 4h, which can effectively release the internal stress and prolong the service life.

挤出压力与打印流量速度测试

Extrusion Force vs Print Volumetric Speed Test



测试参数：12mm 长度铜制加热块，BMG 挤出机，Phaetus 硬化钢喷头，喷嘴大小 0.4mm，层高 0.2mm。

Test parameters: 12mm length brass heat block, BMG extruder, Phaetus Hardened Steel Nozzle, Nozzle size 0.4mm, Layer Height 0.2mm.