

GENERAL INFORMATION

PolyEthylene Naphthalate High Flow (PEN-HF) is a functional FDM filament engineered for on-demand manufacturing of parts requiring chemical resistance, heat stability, and food safety. Certified for FDA, and EU food-contact use, PEN-HF withstands hot liquids, repeated dishwashing, and sterilization (autoclave, & chemical) without degrading performance. With optimized flow behavior, PEN-HF supports high-speed printing up to 300 mm/s with minimal warping, enabling scalable, cost-effective production of liquid-tight, chemically resistant components — without tooling or post-processing. It combines the printability of PETG with performance attributes of advanced polymers like PPSU.

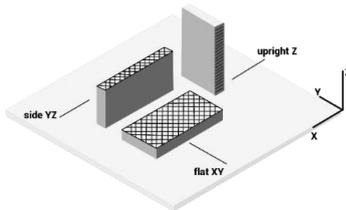
A low surface friction coefficient (0.17; ASTM D1894), UV-blocking transparency, and low creep make PEN-HF well suited for food handling, chemical handling, and single-use chemical processing components. Independent testing confirms that 3D-printed PEN-HF parts pass key benchmarks including dishwasher safety, scratch resistance, and absence of harmful chemical leaching or odor. Parts also retain mechanical strength at elevated temperatures and, when printed at <0.14 mm layer height, show no residual bacterial contamination after standard cleaning — making PEN-HF a reliable choice for clean-contact and hygiene-critical applications.

IMPORTANT KEY FEATURES

- FDA 21 CFR 177.1637 – ensure consumer health and safety
- Temperature resistance: 121 °C (pre-annealing), 166 °C (annealed)
- Fast printing speeds up to 300 mm/s
- Exceptional chemical resistance, transparency and UV-blocking
- Easy 3D printing on desktop printer, even with a 0.2 – 1.0 mm nozzle
- Completely tasteless and odorless



MATERIAL PROPERTIES



The FDM process creates parts with a layered structure, causing mechanical properties to be anisotropic based on print orientation.*1

- Flat XY orientation: predominant mechanical strength from infill
- Side YZ orientation: predominant mechanical strength from walls
- Upright Z orientation: interlayer adhesion strength.

	Test Method [#]	PEN HF		
		XY	YZ	ZX
Tensile strength (MPa)	ISO 527-2 50 mm/min	42.5	29.0	23.7
Elongation (%)	50 mm/min	1.8	1.3	0.8
Tensile modulus (MPa)	1 mm/min	2315	2287	2386
	ISO 178:2019			
Flexural strength (MPa)	2 mm/min	98.0	-	-
Flexural modulus (MPa)	2 mm/min	2154	-	-
	ISO 180:2019			
Izod impact strength (kJ/m ²)	notched	2.1	-	-
	ISO 75-2/B			
HDT (pre-annealed) (°C)	0.45 MPa	117	-	-
HDT (pre-annealed) (°C)	1.82 MPa	112	-	-

CHEMICAL RESISTANCE TABLE *2

Organic Solvent	PEN HF	PPSU	Inorganic Solvent	PEN HF	PPSU
Acetic acid (20%)	A	A	Ammonium chloride (25%)	A	A
Acetone	B	D	Ammonia aq. (28%)	C	A
Alcohols	A	B	Hydrochloric acid (37%)	A	A
Chloroform	C	C	Hydrogen peroxide (30%)	A	B
Dimethyl sulfoxide	C	C	KOH (30%)	B	A
Ethers	A	B	NaCl sat. solution	A	A
Ethyl acetate	A	D	NaHCO ₃ sat. solution	A	A
Gasoline	A	A	NaOCl	A	A
Hexane	A	B	NaOH (30%)	A	A
Methyl ethyl ketone	A	C	Nitric acid (20%)	A	A
Toluene	A	D	Sulfuric acid (10%)	A	A

FILAMENT SPECIFICATION

Diameter (mm)	1.75 ± 0.03 & 2.85 ± 0.06
Color	Nearly transparent
Net filament weight (g)	200 & 1,000

PRINTING PROPERTIES

Nozzle sizes (mm)	0.2 - 1.0	Recommend stainless steel or hardened steel
Nozzle temperature (°C)	265 - 275	Recommended settings, may different according to printer and object
Bed temperature (°C)	75 - 90	
Speed (mm/s)	80 - 140	For 1 st layer and walls
	180 - 300	For infill or draft prototypes
Part cooling fan (%)	0 - 10	May use higher cooling speed for bridges
Retraction speed (mm/s)	30 - 45	
Retraction length (mm)	2 - 7	2 - 4 mm for DD; 4 - 7 mm for Bowden
Bed adhesive	glue stick or PVP	
Storage	vacuum with desiccant	Long term storage
	dry-box (RH <20%)	During use and printing
Drying	65 - 75 °C for 4 - 6 hours	If excessive stringing or surface defects
Support material	HIPS or PVA	

NOTES

*1 The values reported in TDS represent the average from a batch of 10 test specimens. For tensile, flexural, and impact properties of the 3D printed test specimens were produced using a 0.4 mm nozzle, 100% infill, print speed of 60mm/s, a nozzle temperature of 270°C and a build plate temperature of 75°C. FLXR Engineering is continuously working on expanding the TDS data

*2 The chemical resistance of PEN is evaluated by the following test method:

• Specimens are immersed in the chemical (liquid) at 23°C for 30 days.

• Ranking definition: A: weight change <1%, tensile strength retained > 95%;
C: weight change >10%, tensile strength retained < 75%;

B: weight change between 1~10%, tensile strength retained > 75%;
D: swelled or dissolved within 120 hours.

DISCLAIMER

This information sheet has been prepared with the highest level of care. Unless otherwise stated, it is intended solely for general informational purposes. It should not be relied upon for any specific purpose, and no representations or warranties are made regarding its accuracy or completeness.

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