

What is Onyx FR

Onyx FR

Flame-retardant micro carbon fibre filled nylon (Onyx FR™), additive manufacturing / FDM

Onyx FR™ is a flame-retardant variant of Onyx for additive manufacturing using the FDM process. It retains the stiffness and surface finish of Onyx while additionally achieving the UL94 V-0 fire rating at wall thicknesses of 3 mm or more – for parts that must meet non-flammability requirements alongside mechanical performance.

Material Character

Like Onyx, Onyx FR is based on a nylon matrix filled with microscopic carbon fibres, but is additionally formulated with a flame-retardant additive. This gives the material a UL94 V-0 (self-extinguishing) rating at a wall thickness of 3 mm or more, backed by a corresponding UL listing (UL Blue Card).

Mechanically, Onyx FR performs at a level comparable to Onyx – flexural strength and heat deflection temperature are nearly identical, while tensile modulus and flexural modulus are somewhat higher than the standard material due to the flame-retardant formulation.

Like Onyx, Onyx FR can be combined with continuous fibre reinforcement – practically the full range of fibre types available from Markforged can be used, including carbon fibre, a dedicated flame-retardant carbon fibre variant, Kevlar®, fibreglass and HSHT fibreglass.

Advantages and Limitations

Advantages

- Flame retardant to UL94 V-0 at wall thickness ≥ 3 mm, with UL listing
- Mechanical properties at Onyx level
- Compatible with all continuous fibre systems
- Suitable, with appropriate qualification, to meet the FAR 25.853 aerospace standard

Disadvantages

- Hygroscopic – requires dry filament storage for consistent print quality
- Not intended for food contact
- Properties of the printed part depend on print parameters, layer build-up and part orientation
- Higher material cost than standard Onyx

Processing

Onyx FR is built up additively, layer by layer, from filament using the FDM process, in the same way as standard Onyx. The fire classification applies to the stated minimum wall thickness and should be confirmed for the specific part.

Post-processing steps such as sanding or drilling generate fine, carbon-fibre-laden plastic dust, which should be extracted.

Typical Properties

- Flame retardant, UL94 V-0 at wall thickness ≥ 3 mm
- High stiffness and strength for a 3D printing material
- Compatible with all continuous fibre systems
- UL listing (UL Blue Card)

Product Examples

- Weld fixturing
- Aerospace clips and brackets
- Laser marking fixtures
- Energy and electrical brackets and fixtures

Typical Industries

- Aerospace
- Electrical / energy engineering
- Jigs, fixtures and tooling
- Mechanical engineering

	Test Method	Unit	Value
General Properties			
Density		g / cm ³	1.2
Flammability (wall thickness ≥ 3 mm)	UL 94		V-0
Mechanical Properties			
Tensile modulus	ASTM D638	MPa	3000
Tensile stress at yield	ASTM D638	MPa	41
Tensile strain at break	ASTM D638	%	18
Flexural strength	ASTM D7901	MPa	71
Flexural modulus	ASTM D7901	MPa	3600
Thermal Properties			
Heat deflection temperature (0.45 MPa)	ASTM D648, Method B	°C	145

The stated values are average values based on test specimens produced by the additive manufacturing process (FDM). They serve as information for material selection. The flame-retardant classification (UL94 V-0) applies at the stated minimum wall thickness and should be confirmed for the specific part.