



Addigy® PA6/66-GF20 FR LS

Low Smoke Filament

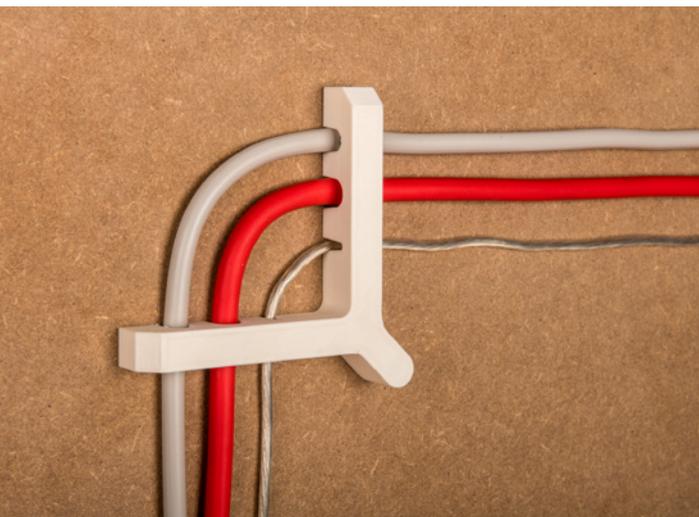


Addigy® PA6/66-GF20 FR LS is one of few commercial filaments that meet norms EN 45545-2, NFPA 130 (ASTM E162, ASTM E662), SMP 800-C and FAR 25.853. Its certifications for flame, smoke and toxicity (FST) make it suitable for railway and other transportation applications.

The Low Smoke filament is a cost-efficient and easier-to-print solution for applications that need to meet European and North American railway norms. This innovative material can be printed easily on standard filament printers, eliminating the need for high-temperature printers.

The proprietary formulation uses a non-halogenated flame retardant with reduced ecological impact, and the composition has been optimized to avoid typical smoke development and achieve the low smoke requirements of the European and North American standards.

The glass-filled material has a high heat deflection temperature.



Key benefits

- Passes standards EN 45545-2, NFPA 130 (ASTM E162, ASTM E662), SMP 800-C and FAR 25.853
- Non-halogenated flame retardant material
- Reduced flame spread, smoke density and toxicity
- Low levels of toxic fume emissions and smoke density allow for safe evacuation in the event of a fire
- Cost-efficient alternative that can be printed on standard FFF printers and does not require high-temperature printers
- Glass-filled material allows for superior thermal performance at elevated temperatures/heat deflection temperature (HDT)
- Reduced thermo-oxidative degradation
- Can be post-processed and painted

Applications

- Electrical in-train parts such as connectors, covers or enclosures, outlet boxes, panels
- Small electrical components such as cable guides, reading lights
- Other internal and external train applications, also visible parts
- Aerospace components

Technical Data

Mechanical properties

Property	Typical values	Units	Test method	Test specimen
Tensile stress at yield, 50 mm/min	–	MPa	ISO 527	Injection-molded
	–	MPa	ISO 527	3D-printed XY/flat at 240°C
at -40°C	–	MPa	ISO 527	3D-printed XY/flat at 240°C
	–	MPa	ISO 527	3D-printed XZ/on edge at 235°C
Tensile stress at break, 50 mm/min	46	MPa	ISO 527	3D-printed XY/flat at 240°C
at -40°C	52	MPa	ISO 527	3D-printed XY/flat at 240°C
	53	MPa	ISO 527	3D-printed XZ/on edge at 235°C
Tensile elongation at yield, 50 mm/min	–	%	ISO 527	3D-printed XY/flat at 240°C
at -40°C	–	%	ISO 527	3D-printed XY/flat at 240°C
	–	%	ISO 527	3D-printed XZ/on edge at 240°C
Tensile elongation at break, 50 mm/min	–	%	ISO 527	Injection-molded
	2.5	%	ISO 527	3D-printed XY/flat at 240°C
at -40°C	2.1	%	ISO 527	3D-printed XY/flat at 240°C
	1.7	%	ISO 527	3D-printed XZ/on edge at 240°C
Tensile modulus (modulus of elasticity), 1 mm/min	3999	MPa	ISO 527	3D-printed XY/flat at 240°C
at -40°C	4056	MPa	ISO 527	3D-printed XY/flat at 240°C
	4876	MPa	ISO 527	3D-printed XZ/on edge at 240°C
Flexural modulus	5588	MPa	ISO 178	Injection-molded
Flexural strength	147	MPa	ISO 178	Injection-molded
Charpy impact notched	13.1	MPa	ISO 179	3D-printed XY/flat at 240°C

Flammability properties

Property	Typical values	Test method	Test specimen
UL 94 flammability rating	V-2 at 0.4mm	UL 94	3D-printed XY/flat at 240°C
	V-2 at 0.8 mm	UL 94	3D-printed XY/flat at 240°C
	V-2 at 1.6 mm	UL 94	3D-printed XY/flat at 240°C
	V-1 at 2.0 mm	UL 94	3D-printed XY/flat at 240°C
	V-0 at 3.2 mm	UL 94	3D-printed XY/flat at 240°C

EN 45545-2+A1 NORM

Property	Typical values	Units	Test method	Test specimen
Oxygen index	33.6 at 4 mm	%	R22 - EN ISO 4589-2	3D-printed XY/flat at 240°C
Maximum optical density (D _s max)	111.1 at 4 mm		R22 - EN ISO 5659-2, 25 kW/m ²	
CIT [®] _{NLP}	0.51 at 4 mm		NF X 70-100-1, NF X 70-100-2, 600°C	

NFPA 130 NORM

Property	Typical values	Test method	Test specimen
Radiant panel index (I _r)	8 at 6 mm	ASTM E162-15b	3D-printed XY/flat at 240°C
Optical density at 4 minutes (D ₄)	94 at 6 mm	ASTM E662-18	
Toxic gas generation	pass	Bombardier SMP 800-C	

FAR 25.853 NORM

Property	Typical values	Units	Test method	Test specimen
Burn length	20.3 (0.8)	mm (")	Vertical test – 12 seconds, FAR 25.853	3D-printed XY/flat at 240°C
Flame time	6.1	s	Vertical test – 12 seconds, FAR 25.853	
Flaming time of drippings	0	s	Vertical test – 12 seconds, FAR 25.853	
Burn rate	n/a (< 38.1 (1.5))	mm/min (in/min)	Horizontal test – 12 seconds, FAR 25.853	

Technical Data

Thermal properties

Property	Typical values	Units	Test method	Test specimen
Melting point	195	°C	ISO 11357, DSC ^b	
Glass transition temperature	–	°C	ISO 11357, DSC ^b	
Heat deflection temperature at 1.8 MPa (A)	114	°C	ISO 75	3D-printed XY/flat at 240°C
Heat deflection temperature at 0.45 MPa (B)	168	°C	ISO 75	

General properties

Property	Typical values	Units	Test method	Test specimen
Density	1293	kg/m ³	ISO 1183	
pH	4.5			1% in H ₂ O
Non-volatile-matter content	~30	%	ISO 3251	

a. Conventional Index of Toxicity. b. DSC = differential scanning calorimetry at 10°C/minute.

Note: results are generated according to the valid testing standards indicated above and the standard operating procedures used by the testing facilities.

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