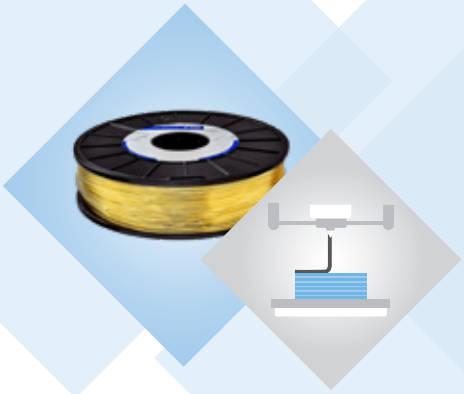
FORWARD AM
Innovating Additive Manufacturing

BASF
We create chemistry



Ultrafuse® PPSU

Flame-retardant high-performance material
High strength and outstanding thermal stability

Building on BASF's Ultrason® materials, Ultrafuse® PPSU was specifically developed for FFF 3D-Printing. With its outstanding range of unparalleled material properties, Ultrafuse® PPSU is perfectly suited for applications where engineering plastics, e.g. Polyamides (PAs) and Polycarbonates (PCs) reach their limitations. Its inherent flame-retardant properties make Ultrafuse® PPSU an excellent 3D printing material for the aerospace industry.

Benefits at a Glance

- Highest temperature resistance
- Excellent layer adhesion
- Inherently flame resistant (passed FAR 25.853 flammability tests)
- Superior chemical resistance (e.g. to fuel, engine oils, disinfectant)
- Resistance to hydrolysis
- Resistance to superheated steam (autoclavable)

Applications

- Aerospace (cabin interior, trolleys, …)
- Powertrain (contact to engine oils)
- Plug-In connectors
- All applications exposed to high temperatures

Material Properties

Tensile Strength (MPa)	65.1 (XY), 51.6 (ZX)
Young's Modulus (MPa)	2037 (XY), 2036 (ZX)
Elongation at Break (%)	6.5 (XY), 3.2 (ZX)
Flexural Strength (MPa)	92.6 (XY), 96.5 (ZX)
Impact Strength Izod unnotched (kJ/m2)	119 (XY), 14.3 (ZX)
HDT @ 0.45 MPa	218 °C
Flammability 60s vertical according to FAR 25.853 (a)	Passed (thicknesses of 1.59 & 6.35 mm)

* Data measured on 3D printed specimens

Printing Guidelines

Nozzle Temperature	390–410 °C
Build Chamber Temperature	170–210 °C
Bed Temperature	220 °C
Bed Material	Glass
Nozzle Diameter	≥ 0.4 mm
Print Speed	25–50 mm/s

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Ultrafuse® PPSU

Case Study

Project reference
Pressure drop optimized air duct

Description of the project & challenge:

For an aerospace case study, our simulation group developed a pressure drop optimized airduct. One of the biggest challenges the team had to cope with in this project were limitations in design space, which is usually very limited in aircrafts. Furthermore, the used material had to fulfil industrial standard flame retardant requirements. The requirements of this case study were met by using BASF materials for Fused Filament Fabrication (FFF) as well as for Powder Bed Fusion (PBF) additive manufacturing. Our engineers optimized the design for each of the two AM processes, ensuring optimal printability and part performance. The FFF version of the part was optimized to be printed with a minimum amount of support material. Additionally, an increased wall thickness in combination with a reduced amount of infill led to a stiff and light structure showing an improved weight-performance ratio.

Our solutions and added value for the customer:

Ultrafuse® PPSU is inherently flame retardant and its excellent layer adhesion enables users to produce strong and media tight parts. Concerning aerospace applications Ultrafuse PPSU already passed the following tests according to FAR 25:

- Flammability 12s + 60s (specimen thicknesses of 1.58 + 6.35 mm)
- Heat Release (specimen thicknesses of 1 mm)
- Optical Smoke Density (specimen thicknesses of 1 mm)
- Smoke Toxicity (specimen thicknesses of 1 mm)

The tests were performed with 3D printed specimens.