

## Nanodiamond Reinforced PLA 3D Filament

Nanodiamond reinforced uDiamond® PLA 3D filament is intended for consumer and industrial use FDM/FFF 3D printing. Tailored nanodiamond addition results in printed item greatly enhanced stiffness and strength but also enhanced thermal properties such as higher Heat Deflection Temperature (HDT) and thermal conductivity. The product affords high dimensional accuracy (low shrinkage) both before and after annealing. If required, the printed components are easy to sand to final finish.

The tailored composition allows significantly enhanced printing speeds (50-500 mm/s) with remained printing quality and can thus enhance greatly the printing productivity.

The recommended printing temperature is 220-250 °C (with certain tools up to 270 °C) and is dependent on printing speed.

uDiamond® PLA 3D filament can be printed without a heated bed.

uDiamond® PLA 3D filaments are available in both 1,75 mm and 2,85 mm diameters.

Available colors: natural; additional colors will be introduced shortly.

### Nanodiamond reinforced PLA filament physical properties:

Property	Test Method	Typical Value
Density (g/cm <sup>3</sup> , at RT)	ISO 1183	1,35
Glass transition temperature (°C)	DSC, 10 °C/min	49,7-55,2
Moisture content*	Thermogravimetric	≤ 0,1 wt.%
Melting temperature (°C)	DSC	171,6-182
Odor	/	Almost odorless
Solubility	/	Insoluble in water
HDT B, 0.45 Mpa, flatwise (°C)	ISO 75	107,2
HDT B, 0.45 MPa, flatwise, annealed (°C)	ISO 75	125,1
Thermal conductivity (W/m•K)	Hot disk method	0,38

- For newly opened product. If 24 hours in controlled environment, the filament moisture will elevate to ≤ 0,15 wt.%. Subsequent drying for 20 h at 50 °C will reduce the moisture into ≤ 0,02 wt.%. The compound physical properties have been analyzed by VTT, Finland.

## Nanodiamond reinforced PLA filament mechanical properties:

Property	Test Method	Typical Value
Young's Modulus (MPa)	ISO 527	6300
Tensile strength (MPa), at max load	ISO 527	43,5
Elongation at Break (%)	ISO 527	3,2
Bending Modulus (MPa)	ISO 178	5446
Bending Strength (MPa)	ISO 178	80.3
Impact strength (kJ/m <sup>2</sup> )	ISO 179	2.5
Impact strength (kJ/m <sup>2</sup> , Scharpy notched 23°C)	ISO 179	2.2

All testing specimens were printed by Mass Portal, using Mass Portal Pharaoh XD20 (SN: 150633) under the following conditions: printing temperature = 270 °C, printing speed = 60 mm/s, heat bed temperature 30 °C.

The compound physical properties have been analyzed by VTT, Finland.