Technical data sheet Tough PLA

Ultimaker

Chemical composition	See Tough PLA safety data sheet, section 3
Description	Ultimaker Tough PLA is a technical PLA filament with toughness comparable to Ultimaker ABS. Ideal for reliably printing technical models at large sizes, our Tough PLA offers the same safe and easy use as regular PLA
Key features	With an impact strength similar and higher stiffness compared to Ultimaker ABS, Tough PLA is less brittle than regular PLA and gives a more matte surface finish quality. Heat resistance is similar to standard PLA filaments, so printed parts should not be exposed to temperatures above 60 °C More reliable than ABS for larger prints, with no delamination or warping. Ultimaker Tough PLA is also compatible with Ultimaker support materials (PVA and Breakaway), giving full geometric freedom when designing parts
Applications	Functional prototyping, tooling, manufacturing aids
Non-suitable for	Food contact and *in vivo* applications. Long term outdoor usage or applications where the printed part is exposed to temperatures higher than 60 °C

Filament specifications

	Value	**Method**
Diameter	2.85 ± 0.05 mm	Ultra-fast CCS-based, dual-axis diameter gauge
Max roundness deviation	0.05 mm	Ultra-fast CCS-based, dual-axis diameter gauge
Net filament weight	750 g	-
Filament length	~ 96 m	-

Color information

Color	**Color code**
Tough PLA Black	RAL 9017
Tough PLA White	RAL 9003
Tough PLA Green	RAL 6038 (est.)
Tough PLA Red	RAL 3018

Mechanical properties*

	Injection molding		3D printing	
	Typical value	**Test method**	**Typical value**	**Test method**
Tensile modulus	-	-	1,820 MPa	ISO 527 (1 mm/min)
Tensile stress at yield	-	-	37 MPa	ISO 527 (50 mm/min)
Tensile stress at break	-	-	37 MPa	ISO 527 (50 mm/min)
Elongation at yield	-	-	3.1%	ISO 527 (50 mm/min)
Elongation at break	-	-	3.1%	ISO 527 (50 mm/min)
Flexural strength	-	-	78 MPa	ISO 178
Flexural modulus	-	-	2,490 MPa	ISO 178
Izod impact strength, notched (at 23 °C)	-	-	9 kJ/m^2	ISO 180
Charpy impact strength (at 23 °C)	-	-	-	
Hardness	-	-	79 (Shore D)	Durometer

Electrical properties*

	Typical value	**Test method**	**Typical value**	**Test method**
Dissipation factor (at 1 MHz)	-	-	0.014	ASTM D150-11
Dielectric constant (at 1 MHz)	-	-	2.62	ASTM D150-11

Thermal properties

	Typical value	**Test method**
Melt mass-flow rate (MFR)	6 - 7 g/10 min	(210 °C, 2.16 kg)
Heat detection (at 0.455 MPa)	-	-
Heat deflection (at 1.82 MPa)	-	-
Vicat softening temperature	63 °C	ISO 306
Glass transition	62 °C	DSC, 10 °C/min
Coefficient of thermal expansion	-	-
Melting temperature	151 °C	DSC, 10 °C/min
Thermal shrinkage	-	-

*See notes

Other properties

	Value	Test method
Specific gravity	1.22	ISO 1183
Flame classification	-	-

Notes

Properties reported here are average of a typical batch. The 3D printed test specimens were printed in the XY plane, using the fine quality profile in Ultimaker Cura 3.1, an Ultimaker 3, a 0.4 mm AA print core, 90% infill, 0.1 mm layer height, and 205 °C nozzle temperature. The values are the average of five white specimens for the tensile, flexural, and impact tests. The Shore hardness D was measured in a 7-mm-thick square printed as indicated above with 100% infill. The electrical properties were measured on a 54-mm-diameter disk with 3 mm thickness printed in the XY plane, using the fine quality profile (0.1 mm layer height) in Ultimaker Cura 3.2.1, an Ultimaker 3, a 0.4 mm print core, and 100% infill. Ultimaker is constantly working on extending the TDS data.

Disclaimer

Version Version 1.002

Date September 3, 2018