Ultimaker

Ultimaker PETG
Technical data sheet

General overview

Chemical composition	See PETG safety data sheet, section 3
Description	Ultimaker PETG key has good all-round properties, making it an ideal starting material for anyone requiring more heat and chemical resistance than PLA
Key features	Ultimaker PETG material is an affordable all-round material that is easy to use. It prints just as easy as PLA, and can be used with Ultimaker support materials (PVA and Breakaway). In contrast to PLA, it is less brittle and offers additional resistance additional resistance to alcohols and weak acids/bases, as well as additional heat resistance up to 76 °C.
Applications	Visual prototyping, Functional prototyping, Short-run manufacturing, Custom components, Fit testing, Tooling, Custom connectors or packages for liquids
Non-suitable for	Food contact and in vivo applications. Applications where the printed part is exposed to temperatures higher than 76 °C

Filament specifications

	Method (standard)	Value
Diameter	–	2.85 ± 0.05 mm
Max roundness deviation	–	0.05 mm
Net filament weight	–	750g
Filament length	–	~ 93 m

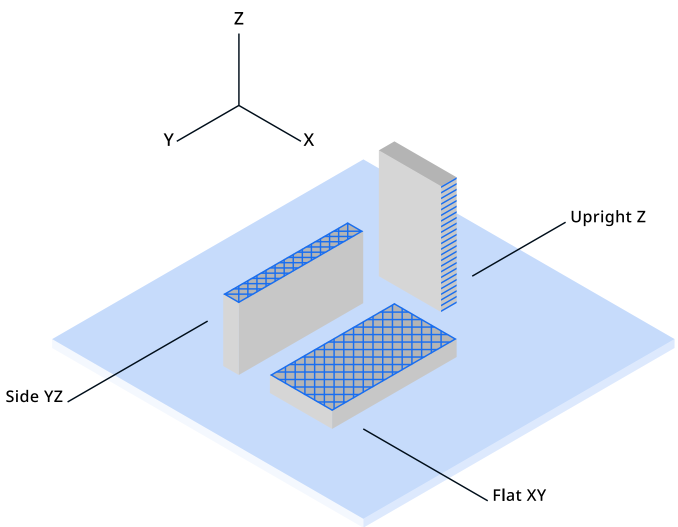
Color information

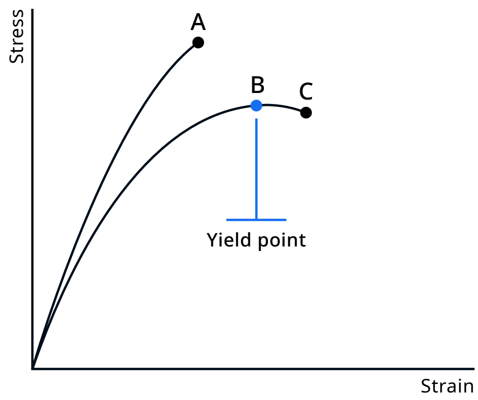
Color	Color code
Black	RAL 9017
White	RAL 9003
Silver	RAL 9006
Grey	RAL 7012
Transparant	N/A
Blue	RAL 5005
Blue Translucent	Pantone 286 C
Red	RAL 3020
Red Translucent	Pantone 7622 C
Green	RAL 6024
Green Translucent	Pantone 3425 C
Yellow	RAL 1016
Yellow Fluorescent	Pantone 3570 C
Orange	Pantone 1655 C

Mechanical properties

All samples were 3D printed. See 'Notes' section for details.

	Test method	Typical value		
		XY (Flat)	YZ (Side)	Z (Up)
Tensile (Young's) modulus	ASTM D3039 (1 mm / min)	1939 ± 28 MPa	1874 ± 31 MPa	1711 ± 45 MPa
Tensile stress at yield	ASTM D3039 (5 mm / min)	46.2 ± 0.8 MPa	50.3 ± 1.0 MPa	–
Tensile stress at break	ASTM D3039 (5 mm / min)	38.5 ± 1.4 MPa	44.0 ± 3.7 MPa	19.0 ± 6.4 MPa
Elongation at yield	ASTM D3039 (5 mm / min)	5.9 ± 0.1%	6.0 ± 0.2%	–
Elongation at break	ASTM D3039 (5 mm / min)	7.6 ± 0.2%	6.4 ± 0.6%	1.8 ± 0.8%
Flexural modulus	ISO 178 (1 mm / min)	1882 ± 30 MPa	1681 ± 61 MPa	1489 ± 25 MPa
Flexural strength	ISO 178 (5 mm / min)	78.9 ± 1.0 MPa at 5.5% strain	75.8 ± 2.0 MPa at 5.5% strain	50 ± 3.5 MPa at 3.6% strain
Flexural strain at break	ISO 178 (5 mm / min)	No break (>10%)	No break (>10%)	3.6 ± 0.4%
Charpy impact strength (at 23 °C)	ISO 179-1 / 1eB (notched)	7.9 ± 0.6 kJ/m²		
Hardness	ISO 7619-1 (Durometer, Shore D)	76 Shore D		





A. Tensile stress at break, elongation at break (no yield point)
B. Tensile stress at yield, elongation at yield
C. Tensile stress at break, elongation at break

Print orientation

As the FFF process produces part in a layered structure, mechanical properties of the part vary depending on orientation of the part. In-plane there are differences between walls (following the contours of the part) and infill (layer of 45° lines). These differences can be seen in the the data for XY (printed flat on the build plate - mostly infill) and YZ (printed on its side - mostly walls). Additionally, the upright samples (Z direction) give information on the strength of the interlayer adhesion of the material. Typically the interlayer strength (Z) has the lowest strength in FFF.

Note: All samples are printed with 100% infill - blue lines in the ilustration indicate typical directionality of infill and walls in a printed part.

Tensile properties

Printed parts can yield before they break, where the material is deforming (necking) before it breaks completely. When this is the case, both the yield and break points will be reported. Typical materials that yield before breaking are materials with high toughness like Tough PLA, Nylon and CPE+.

If the material simply breaks without yielding, only the break point will be reported. This is the case for brittle materials like PLA and PC Transparant, as well as elastomers (like TPU).

Thermal properties

Samples marked with an asterisk (*) were 3D printed. See 'Notes' section for details.

	Test Method	Typical value
Melt mass-flow rate (MFR)	ISO 1133 (190 °C, 2.16 kg)	6.4 g / 10 min
Heat deflection (HDT) at 0.455 MPa*	ISO 75-2 / B	76.2 ± 0.8 °C
Vicat softening temperature*	ISO 306 / A120	82.9 ± 0.4 °C
Glass transition	ISO 11357 (DSC, 10 °C / min)	77.4 °C
Melting temperature	ISO 11357 (DSC, 10 °C / min)	- (amorphous)

Other properties

Specific gravity	ISO 1183	1.27 g / cm^3

Notes

*3D Printing: all samples were printed using a new spool of material loaded in an Ultimaker S5 Pro bundle with engineering intent profiles using 0.15 mm layer height with AA0.4 printcore and 100% infill, using Ultimaker Cura 4.9. Samples were printed 'one-at-a-time'. Printed samples were conditioned in room temperature for at least 24h before measuring.

Specimen dimensions (L x W x H):
- Tensile test: 215 x 20 x 4 mm
- Flexural/Vicat/HDT: 80 x 10 x 4 mm
- Charpy: 80 x 10 x 4 mm with printed Notch (Type 1eB)

Disclaimer

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