



## Ultrafuse<sup>®</sup> PP

Chemical resistant | biocompatible | low density

## Extended TDS

Complete Technical Documentation and  
Testing Summary

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# Technical Data Sheet

**High-performance thermoplastic with low density, high elasticity and high resistance to fatigue.**

## Filament Properties

Filament Diameter	1.75 mm	2.85 mm
Average diameter Tolerance	±0.050 mm	±0.1 mm
Average ovality	<0.050 mm	<0.050 mm
Available Spool size	750 g	750 g
Available colors	natural	

## Spool Properties

Spool size	750 g	2.0 kg	4.0 kg	8.0 kg
Outer diameter	200 mm	300 mm	350 mm	355 mm
Inner diameter	50.5 mm	51.5 mm	51.7 mm	36 mm
Width	55 mm	103 mm	103 mm	167 mm

## Recommended 3D-Print processing parameters

## Used for test specimens

Printer	FFF printer	Ultimaker S5
Nozzle Temperature <sup>1)</sup>	220 – 240°C	240 °C
Build Chamber Temperature	-	-
Bed Temperature	60 – 80°C	80°C
Bed Material	PP adhesive or tape	Glass + magigoo PP
Nozzle Diameter	≥ 0.4 mm	0.4 mm
Print Speed	20 - 50 mm/s	40 mm/s
Max Volumetric Speed <sup>2)</sup>	8 mm <sup>3</sup> /s	//

Please check your standard and/or high speed print profile availability for an easy start at [www.forward-am.com](http://www.forward-am.com).

<sup>1</sup> Fast printing might require an additional increase of the nozzle temperature; the stated printing speed is based on current validations. As equipment and technology continues to evolve, it is possible that even higher printing speeds may be attainable in the future.

<sup>2</sup> Based on Bambu Lab X1C with a nozzle diameter of 0.4 mm

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Please contact us for further product information, like for example REACH, RoHS, FCS.

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Process materials in a well-ventilated room, or use professional extraction systems.

## Further Recommendations

Drying recommendations to ensure printability and best mechanical properties<sup>3)</sup> 60 °C in a hot air dryer or vacuum oven for 4 to 16 hours

General Properties	Standard	Average Values
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Filament Density <sup>4)</sup>	ISO 1183-1	901 kg/m <sup>3</sup>
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Tensile Properties <sup>5)</sup>	Standard	Average Values		
		XY-Direction <sup>6)</sup>	XZ-Direction <sup>7)</sup>	ZX-Direction <sup>8)</sup>

Tensile strength <sup>9)</sup>	ISO 527	15.5 MPa	-	9.0 MPa
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Elongation at Break <sup>9)</sup>	ISO 527	118.6 %	-	5.4 %
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Young's Modulus <sup>10)</sup>	ISO 527	541 MPa	-	435 MPa
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Flexural Properties <sup>6) 11)</sup>	Standard	Average Values		
		XY-Direction	XZ-Direction	ZX-Direction

Flexural Strength	ISO 178	22.9 MPa	21.4 MPa	15.6 MPa
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Flexural Modulus	ISO 178	575 MPa	494 MPa	380 MPa
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Flexural Elongation at Break	ISO 178	9.4 %	8.8 %	7.9 %
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<sup>3)</sup> Please note: To ensure constant material properties the material should always be kept dry.

<sup>4)</sup> measured on filament

<sup>5)</sup> Samples were conditioned in standard climate (23°C, 50% RH 72h)

<sup>6)</sup> 

<sup>7)</sup> 

<sup>8)</sup> 

<sup>9)</sup> Testing speed: 5 mm/min

<sup>10)</sup> Testing speed: 1 mm/min

<sup>11)</sup> Testing speed: 2 mm/min

Impact Properties <sup>6)</sup>	Standard	Average Values		
		XY-Direction	XZ-Direction	ZX-Direction
Impact Strength Charpy (notched)	ISO 179-2	5.3 kJ/m <sup>2</sup>	8.3 kJ/m <sup>2</sup>	2.5 kJ/m <sup>2</sup>
Impact Strength Charpy (unnotched)	ISO 179-2	41.8 kJ/m <sup>2</sup>	62.3 kJ/m <sup>2</sup>	13.6 kJ/m <sup>2</sup>
Impact Strength Izod (notched)	ISO 180	5.3 kJ/m <sup>2</sup>	10.6 kJ/m <sup>2</sup>	2.3 kJ/m <sup>2</sup>
Impact Strength Izod (unnotched)	ISO 180	37.7 kJ/m <sup>2</sup>	37.6 kJ/m <sup>2</sup>	11.6 kJ/m <sup>2</sup>

Thermal Properties <sup>6)</sup>	Standard	Average Values
HDT A at 1.8 MPa	ISO 75-2	49 °C
HDT B at 0.45 MPa	ISO 75-2	69 °C
Vicat softening point at 50 N	ISO 306	61 °C
Vicat softening point at 10 N	ISO 306	106 °C
Crystalization Temperature	ISO 11357-3	83 °C
Melting Temperature	ISO 11357-3	131 °C
Melt Volume-Flow Rate (MVR)	ISO 1133	6.7 cm <sup>3</sup> /10 min (230 °C, 2.16 kg)
Melt Mass-Flow Rate (MFR)	ISO 1133	4.8 g/10 min (X°C, X kg)

Hardness and Abrasion	Standard	Typical Values
Shore Hardness D (15s)	DIN ISO 7619-1	52

Biocompatibility	Standard	Typical Values
Cytotoxicity - Neutral Red	ISO 10993-5 (2009)	PASS
In Vivo Sensitization - Local Lymph Node Assay	ISO 10993-10 (2013)	PASS
In Vitro Skin Irritation	ISO 10993-10 (2013)	PASS

For the statement on Biocompatibility data see Chapter [Biocompatibility](#).

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# Biocompatibility



## Biocompatibility product Information

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**Product: Ultrafuse® PP**

Revision: 12/3/2014

Version: 1.4

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Ultrafuse® PP material is 3D printed as test specimens and successfully passed the requirements of the stated tests below:

- **Cytotoxicity XTT Test - Neutral red (ISO 10993-5:2009)**  
The extract of the product Ultrafuse® PP resulted in a cell vitality of more than 70% in comparison to the negative control and can therefore be considered to be not cytotoxic.
- **Skin Irritation Test (ISO10993-10:2013)**  
All 10 volunteers exhibited no dermal changes in the test zone at 24h, 48h and 72h when exposed to Ultrafuse® PP.
- **Skin Sensitisation Test - Local Lymph Node Assay KretinoSens (ISO10993-10:2020)**  
The extracts of the product Ultrafuse® PP resulted in an induction of the luciferase activity of less than 1.5 times compared to the DMSO control and is therefore assessed as non-sensitizing.

The performed biocompatibility tests were recorded on test specimen of the above referenced product to show compatibility of the material in general. The biocompatibility tests listed are not part of any continuous production protocol. The test assessments reflect only the test specimen and have to be retested on the final product. It remains the responsibility of the device manufacturers and/or end-users to determine the suitability of all printed parts for their respective application.

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