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Comparison Sheet | Innofil3D and Ultrafuse Filaments

Overview of Mechanical Properties of Printed Test Specimens

This Comparison Data Sheet contains standardized material data for 3D-printed test specimens according to ISO 178, ISO 179 and ISO 527.
For detailed information, see the Technical Datasheets: www.innofil3d.com/material-data

Material Overview	
PLA	Low warping, bio based, compostable, easy printing
PET	Low moisture absorption, dimensionally stable, easy to print, prints waterthight
ABS	Impact resistant, heat resistant, high toughness
PRO1 tough PLA	Engineering tough PLA, high strength, tough, versatile, fast and easy printing
ABS Fusion+	Low warp, direct printing on glass, high heat resistance, can be printed with BVOH
ASA	UV resistant, weather resistant, anti-static properties
PP	Low density, resistant to fatigue, chemical resistant
HIPS	Suitable for sanding and painting, ABS support
PET CF15	Strong and stiff parts, easy to process, very low moisture uptake, temperature resistance up to 74°C
PAHT CF15	Higher chemical resistance than most PA grades, high temperature resistance up to 150°C, strong and stiff parts, high dimensional stability, easy to process
PP GF30	Excellent chemical resistance, low density, low moisture uptake, high temperature resistance, improved UV-resistance
Ultrafuse PA	Good fatigue resistance, good wear resistance, lower melting point makes it printable on several FFF printers, very strong
Ultrafuse TPU 85A	High wear and abrasion resistance, excellent damping characteristics, very good low-temperature flexibility, high resistance to oils, greases oxygen and ozone

Innofil3D & Ultrafuse Filaments

Printing Guidelines								
	Nozzle temperature (°C)	Minimum nozzle diameter (mm)	Bed temperature (°C)	Bed modification	Active cooling fan maximum (%)	Layer height (mm)	Shell thickness (mm)	Print speed (mm/s)
PLA	210-230	0.4	60	below 60 °C tape/glue	100	0.08-0.2	0.4-0.8	40-80
PET	210-230	0.4	75	below 75 °C tape/glue	100	0.08-0.2	0.4-0.8	40-80
ABS	240-260	0.4	80-100	tape/glue	25	0.1-0.2	0.4-0.8	40-80
Flex45	220-240	0.4	up to 60	kapton tape	100	0.1-0.2	0.8-2.0	20-50
Flex60	210-230	0.4	30-60	unheated needs tape	100	0.1-0.2	0.8-0.2	40-80
rPET	225-245	0.4	75	below 75 °C tape/glue	100	0.1-0.2	0.08-2.0	40-80
PRO1	200-220	0.4	60	below 60 °C tape/glue	100	0.08-0.2	0.4-0.8	40-150
ABS Fusion+	240-260	0.4	100-120	clean with ethanol	0	0.08-0.2	0.8-1.2	40-80
ASA	250-270	0.4	100	hairspray	100	0.1-0.2	0.8-1.0	40-80
HIPS	250-270	0.4	90-110	glass/blue tape	50	0.1-0.2	0.8-1.0	40-80
PP	220-240	0.4	60	pp tape	100	0.1-0.2	0.4-1.0	40-80
PET CF15	250-260	0.6 hardened	75	clean glass	0	0.2-0.4	1.2-1.8	40-60
PAHT CF15	260-280	0.6 hardened	80-100	clean glass	0	0.2-0.4	1.2-1.8	40-60
PP GF30	230-250	0.6 hardened	20-40	fiber reinforced PP tape (scotch)	50	0.2-0.4	1.2-1.8	30-80
Ultrafuse PA	220-250	0.4	90-120	Glass + PVA glue stick / Kapton tape	to be determined	to be determined	to be determined	30-60
Ultrafuse TPU 85A	220-260	0.4	40	clean glass	to be determined	to be determined	to be determined	15-40

Material Properties

Tested According to ISO Standards

ISO 527 — **Tensile Tests.** Minimum number of 6 specimens with 100% infill each are tested, printed both horizontally and vertically (see TDS).

ISO 178 — **Flexural Tests.** 10 specimens normal, 10 specimens upright, all 100% infill.

ISO 179 — **Charpy Impact Tests.** Unnotched. 10 specimens normal and 10 specimens upright, all 100% infill.

Test specimens have been printed under the following conditions:

	PLA	PET	ABS	PRO1	ABS FUSION+	ASA	HIPS	PP	PP GF30	Ultrafuse PA
Printing temp. (°C)	210	210	240	210	250	260	260	230	260	240
Heated bed temp. (°C)	60	75	90	60	100	100	100	60	30	90
Print speed (mm/s)	40	40	40	40	40	40	40	40	40	40

General Properties			
	Melt temperature (°C)	Glass transition temperature (°C)	Printed Part Density (g/cm³)
PLA	145-160	60	1.26
PET	amorphous	62	1.34
ABS	amorphous	105	1.04
Flex45	180	-35	1.15
Flex60	140-155	to be determined	1.25
rPET	210	to be determined	to be determined
PRO1	170-180	63	1.25
ABS Fusion+	amorphous	82 and 117	1.08
ASA	amorphous	103	1.06
HIPS	amorphous	97	1.04
PP	141	to be determined	0.9
PET CF15	250	74	1.23
PAHT CF15	235	to be determined	1.18
PP GF30	167	to be determined	0.94
Ultrafuse PA	195-197	49	1.12
Ultrafuse TPU 85A	to be determined	-42	to be determined

Mechnical Properties

	Tensile Strength (MPa)		Elongation at Max Force (%)	
	horizontal	vertical	horizontal	vertical
PLA	38.1	28.8	2.1	1.1
PET	40.9	22.8	3	1.3
ABS	29.3	6.5	2.4	0.7
rPET	to be determined	to be determined	to be determined	to be determined
PRO1	48	21.8	2.7	0.9
ABS Fusion+	18.9	6.3	2.8	0.7
ASA	26.8	12.4	2.6	1
HIPS	19.3	11.1	1.4	1.2
PP	11.9	8.9	11.9	3
PET CF15	to be determined	to be determined	to be determined	to be determined
PAHT CF15	to be determined	to be determined	to be determined	to be determined
PP GF30	35.3	14.6	3.9	0.9
Ultrafuse PA	61.4	16.4	61.4	16.4
Ultrafuse TPU 85A	to be determined	to be determined	to be determined	to be determined

	Elongation at Break (%)		Tensile Modulus (MPa)	
	horizontal	vertical	horizontal	vertical
PLA	2.8	1.1	2852	3150
PET	3.1	1.3	2264	2140
ABS	3.7	0.7	2030	1358
rPET	to be determined	to be determined	to be determined	to be determined
PRO1	21.9	0.9	3166	2930
ABS Fusion+	5.1	0.7	1068	950
ASA	3.5	1.1	1370	1367
HiPS	12.3	1.3	1547	1403
PP	> 200	3.2	470	554
PET CF15	to be determined	to be determined	to be determined	to be determined
PAHT CF15	to be determined	to be determined	to be determined	to be determined
PP GF30	4.4	0.9	3000	1980
Ultrafuse PA	to be determined	to be determined	2419	2149
Ultrafuse TPU 85A	to be determined	to be determined	to be determined	to be determined

Impact Strength (kJ/m³)			Impact Energy (mJ)	
	Edge Normal	Edge Parallel	Edge Normal	Edge Parallel
PLA	14.2	13.1	522	502
PET	12.4	5.2	473	199
ABS	39.3	35.4	1500	1372
rPET	to be determined	to be determined	to be determined	to be determined
PRO1	18.8	20.4	755	813
ABS Fusion+	32.2	24.5	1277	971
ASA	20.5	21.8	821	867
HiPS	34	2.1	1374	1215
PP	1.4	61	1504	2281
PET CF15	to be determined	to be determined	to be determined	to be determined
PAHT CF15	to be determined	to be determined	to be determined	to be determined
PP GF30	23.2	19.8	983	811
Ultrafuse PA	29.7	23	not available	not available
Ultrafuse TPU 85A	to be determined	to be determined	to be determined	to be determined

Flexural Modulus (MPa)			Maximum Force (MPa)		Deformation (%)	
	Flat Normal	Flat Parallel	Flat Normal	Flat Parallel	Flat Normal	Flat Parallel
PLA	2410	2551	65.7	86.2	4.1	3.8
PET	2089	2281	93	76.7	4.5	4.1
ABS	1965	1681	67.3	72.6	4.3	4.4
rPET	to be determined	to be determined	to be determined	to be determined	to be determined	to be determined
PRO1	2823	2340	92.4	99.1	4.3	4.4
ABS Fusion+	838	1104	30.6	43.6	9.1	8.2
ASA	2903	2592	53.1	63.7	7.4	7.7
HiPS	2928	2310	28	68.9	8.8	17.3
PP	1512	2466	19.6	24.5	11.2	11.6
PET CF15	to be determined	to be determined	to be determined	to be determined	to be determined	to be determined
PAHT CF15	to be determined	to be determined	to be determined	to be determined	to be determined	to be determined
PP GF30	2450	4130	62.5	89	9.7	4.9
Ultrafuse PA	2051	2246	80.8	99.8	no break	no break
Ultrafuse TPU 85A	to be determined	to be determined	to be determined	to be determined	to be determined	to be determined

BASF Innofil3D & Ultrafuse Property Summary

Property Rating	Easy printing	Post processing	Heat resistance	Dimensional stability	Durability	Flexibility	UV resistance	Environ-mental
PLA	●●●●	●●	●	●●●●	●	●	●	●●●
PET	●●●●	●●	●●	●●●●	●	●	●●	●
ABS	●●	●●●●	●●●	●	●●●●	●	●●	●
Flex45	●	●	●	●●●	●●●●	●●●●	●●	●
Flex60	●●	●	●	●●●	●●●●	●●●	●●	●
rPET	●●●●	●●	●●	●●●●	●	●	●●	●●●●
FR	●●●●	●●	●	●●●●	●	●	●●	●
PRO1	●●●●	●●●	●●● (after annealing)	●●●●	●●●●	●	●●	●●●
ABS Fusion+	●●●●	●●●	●●●	●●●	●●●●	●	●●	●
ASA	●●●	●●●	●●●	●●	●●●●	●	●●●●	●
HIPS	●●●	●●●●	●●	●●	●	●	●●	●
PP	●	●	●●	●	●●●●	●	●●	●
PET CF15	●●●	●	●●	●●●	●	●	●●	●
PAHT CF15	●●●	●	●●●●	●●●●	●	●	●●	●
PP GF30	●	●	●●●	●	●	●	●●	●
Ultrafuse PA	●●●	●	●●	●●	●●●	●	●●	●
Ultrafuse TPU 85A	●●●●	●	●●	●●●	●●●●	●●●●	●●	●

Please note that this comparison sheet is created in February 2019 and is subject to continuous updating and supplementing of data that are currently being determined.