PolyFlex™ TPU95-HF

Industrial

For other languages, please visit
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Printing with PolyFlex™ TPU95-HF

PolyFlex™ TPU95-HF

PolyFlex™ TPU95-HF, created from Covestro's Addigy® family, is a TPU with high flow properties making it ideal for high speed printing. Combined with its UV resistance, PolyFlex™ TPU95-HF unlocks new applications for flexible materials in manufacturing.

Printing settings

Nozzle Temperature:	200–220˚C
Bed Temperature:	25˚C-50˚C
Chamber Temperature:	20˚C-30˚C
Printing Speed:	40mm/s-100mm/s
Cooling Fan:	ON

Note: Settings are based on 0.4 mm nozzle, and may vary with different printers and nozzle diameters.

Bed surface

PolyFlex™ TPU95-HF can be printed on glass, buildtak or similar products, PEI sheet or painters tape. Using Magigoo Pro Flex can improve the adhesion of PolyFlex™ TPU95-HF on the printing surface.

Direct and indirect drive extruders

Direct drive: The extruder is on top of the hot end
Indirect drive: The extruder is linked to the hot end by a Bowden tube
Usually it is recommended to use direct drive printers to print TPU, however the high flow properties of PolyFlex™ TPU95-HF allows the material to achieve high printing speed even on indirect drive printer. (~100mm/s)

Feed rates

Unlike other flexible filaments, the high flow properties of PolyFlex TPU95-HF allows it to have a more consistent extrusion rate, similar to hard materials.

Resistance from the filament spool

PolyFlex™ TPU95-HF has a carefully chosen shore hardness which allows it to not stretch excessively when pulled by the extruder which could results in under extrusion issues. This feature ensures consistent extrusion, even at very high speeds.

Retraction settings

Usually TPU filaments do not handle retraction settings very well because of the flexible nature of the filament. PolyFlex™ TPU95-HF high flow properties means that the filament requires very little pressure change to stop or begin extrusion. Therefore, PolyFlex™ TPU95-HF can handle similar retraction settings as rigid/hard materials.

Dry box system

PolyFlex™ TPU95-HF is a thermoplastic polyurethane (TPU) based material which makes it hygroscopic. This means that it is susceptible to absorbing moisture from the air which can subsequently affect the quality and mechanical properties of the final prints. We recommend storing PolyFlex™ TPU95-HF in a PolyBox™ to prevent moisture absorption. If the filament has absorbed moisture it can be dried at 70˚C for 12 hours in a convection oven.

Support material

PolyDissolve™ S1 is the recommended support material for PolyFlex™ TPU95-HF.

PolyFlex™ TPU95-HF is also a great material to support itself.

For more information, please visit
www.polymaker.com

PCP: Profile Creation Process

The profile creation process (PCP) allows users to rapidly develop a printing profile for any given material/printer. During this process is important to consider all of these factors to build a successful profile.

> Geometry
> Material
> Printer
> Environment
> Purpose

Polymaker developed the PCP to assist customers in creating their own tailored print profiles; taking into account the material, printer, environment as well as the models geometry and purpose. Additionally, the PCP allows individuals to develop their own knowledge and troubleshooting skills.

The PCP is available on www.polymaker.com

The PCP is divided in 5 steps:

It uses less than 300g of materials and less than 7h of working time.

Step 1: Extrusion Flow
Step 2: Flow Management
Step 3: Cooling Fan
Step 4: Warpage
Step 5: Fine Details

Each of these steps has a specific objective and introduces an important concept about the FFF 3D printing process. Each step will also give you the possibility to push your test further for more accurate results.

PolyFlex™ Family

PolyFlex™

	TPU90		TPU95	TPU95-HF	
Melt index	6.1 (g/10 min at 185˚C)		3-6 (g/10 min at 210˚C)	9.3 (g/10 min at 185˚C)	
Shore hardness	90A		~95A	95A	
100% modulus MPa (X-Y)	3.40	6.17	9.4	11.05	13.24
Tensile strength MPa (X-Y)	12.1	30.0	29.0	24.19	23.11
Elongation at break % (X-Y)	638.8	586.8	330.1	427.0	462.3
	A	B		A	C

A Column: Extrusion multiplier 100%
B Column: Extrusion multiplier 120%
C Column: Extrusion multiplier 115%

*The melt index of PolyFlex™ TPU95 at 185˚C is too low to be tested (<1 g/10min)
The melt index of PolyFlex™ TPU95-HF at 210˚C is too high to be tested (>>15g/10min)

Note: Tested with 3D printed specimens.

PolyFlex™ TPU95-HF

PolyFlex™ TPU95-HF is a TPU specifically engineered to have high flow and UV resistance properties:

High Flow property:

To extrude a material the extruder has to push the filament towards the nozzle in order to create a certain degree of pressure to overcome the materials viscosity. The viscosity of the material mainly depends on the nozzle temperature. The higher the temperature the lower the viscosity and the pressure needed from the extruder to extrude the filament.

PolyFlex™ TPU95-HF high flow allows it to have a low viscosity at low temperatures, therefore for the same amount of pressure from the extruder, PolyFlex™ TPU95 is able to extrude faster resulting in a faster printing speed. Contrarily to similar TPUs on the market, PolyFlex™ TPU95-HF does not require high temperature for high speed printing which also results in better cooling rate therefore better surface quality.

UV resistance property:

Ultraviolet (UV) light is probably the most damaging environment for plastics. All applications of plastics which are used outdoors are therefore at risk, from roofing and window frames to vehicles.
ISO 4892-2 is an accelerated weathering test standard to measure the UV resistance ability by exposing samples to fluorescent UV.

UV resistance property:

PolyFlex™ TPU95-HF	L	a	b	ΔE
72 H	83.52	-0.31	3.02	0.9

The color difference of PolyFlex™ TPU95-HF is imperceptible after being exposed to fluorescent UV after 72 hours.

Note 1: ΔE measures the change in visual perception of two given colors. On a typical scale, ΔE value will range from 0 to 100. ΔE of 1.0 is the smallest color difference the human eye can see, so any ΔE less than 1.0 is imperceptible.

Note 2: It is worth noting that the correlation between outdoor and artificial weathering devices is very material dependent. Other variables need to be taken into consideration and therefore it can be difficult to correlate natural UV exposure in a particular location to a period of time in a weathering chamber. In theory, 72 hours in a weathering chamber could have the same effect as several months to several years in certain locations.

Material Development

If your application requires a specific material that is not yet available in the market, consider our custom development service. With our talented material scientists and application engineers, we are ready to develop the necessary materials to enable your unique application.

Material development

-Twin-screw compounding
-Single-screw extrusion
-Torque rheometry
-Wet chemistry
-Other polymer processing equipment

Testing and characterization

-Thermal characterization (DSC, softening point)
-Mechanical testing (tensile, 3-point bending)
-Optical microscopy
-Capillary rheometry
-FTIR-ATR

3D Printing

-3D printing
-Post-processing
-Application development

Our state-of-the art R&D facilities allow us to engineer materials at different levels and fully optimize them for 3D printing. Our goal is to deliver materials with the right combination of properties/functions, processability and form to suit your needs!

Application

Processability technologies

Printing thechnologies
Post-processing
Other

Properties & functions

Mechanical
Thermal
Electrical
Other

Form

Pellet
Filament
Powder
Other

Polymaker products

PolyLite™

PLA
PETG
ABS
PC
ASA

PolyMax™

PLA
PETG
PC
⚙ PC-FR

PolyFlex™

TPU90
TPU95
⚙ TPU95-HF

PolyMide™

CoPA
⚙ PA6-CF
⚙ PA6-GF

PolyDissolve™

S1
S2

Specialty

PolyWood™
PolySmooth™
PolySupport™
PolyCast™
⚙ Polymaker™ PC-PBT
⚙ Polymaker™ PC-ABS

Hardware

PolyBox™
Polysher™

More products
coming soon...

Industrial range: ⚙

Technologies

JAM-FREE™

Regular PLA

With Jam-Free™

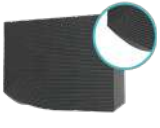
ASH-FREE™

Without Ash-Free™
Ash content: 0.5%

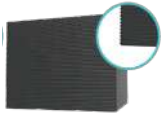
With Ash-Free™
Ash content: 0.003%

WARP-FREE™

Regular Nylon



With Warp-Free™



STABILIZED FOAMING™

Wood

Stabilized Foaming™

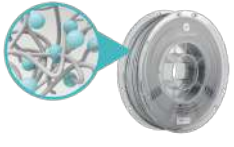
LAYER-FREE™

Rough surface

With Layer-Free™

FIBER ADHESION™

NANO-REINFORCEMENT



About Polymaker

Our Values

Customer Oriented

Responsible

Entrepreneurial

Embracing Innovation

Mission

Polymaker is committed to lowering the barriers to innovation and manufacturing, by continuously developing advanced 3D printing material technologies for industries and consumers.

Contact us

For any inquiries please contact:

inquiry@polymaker.com

For technical support please contact:

support@polymaker.com

The information provided in this document is intended to serve as basic guidelines on how particular product can be used. Users can adjust the printing conditions based on their needs and actual situations. It is normal for the product to be used outside of the recommended ranges of conditions. Each user is responsible for determining the safety, lawfulness, technical suitability, and disposal/recycling practices of Polymaker materials for the intended application. Polymaker makes no warranty of any kind, unless announced separately, to the fitness for any particular use or application. Polymaker shall not be made liable for any damage, injury or loss induced from the use of Polymaker materials in any particular application

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