



PolyFlex™ TPU95-HF



Industrial

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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 result in under extrusion issues. This feature ensures consistent extrusion, even at very high speeds.

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## **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.

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## **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.

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## **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](http://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](http://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



	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
	<b>A</b>		<b>B</b>	<b>A</b>	<b>C</b>

**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	$\Delta E$
72 H	83.52	-0.31	3.02	0.9

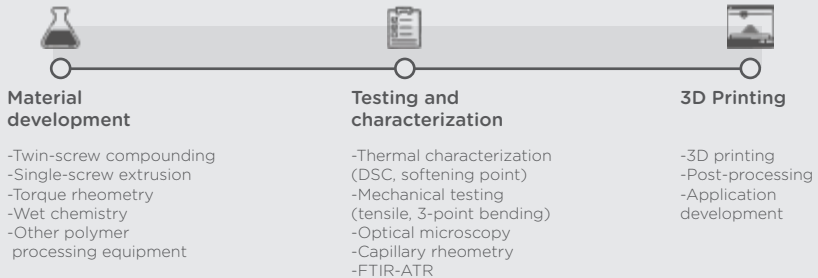
The color difference of PolyFlex™ TPU95-HF is imperceptible after being exposed to fluorescent UV after 72 hours.

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

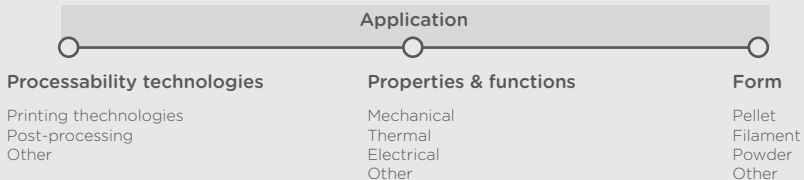
**Note 2:** It is worth noting that the correlation between outdoor and artificial weathering devices is very material dependent. Other variables need to be taken into consideration and therefore it can be difficult to correlate natural UV exposure in a particular location to a period of time in a weathering 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.



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!



# 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](mailto:inquiry@polymaker.com)

For technical support please contact:

[support@polymaker.com](mailto: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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