# Printing Recommendations for Flexible Materials Filament PM

RubberJet TPE 88 · RubberJet TPE 32 · TPU 96 | Prusa CORE One & Bambu Lab P1S

Filament PM flexible filaments cover a wide range of hardnesses – from soft, springy TPE to tough technical TPU. This document summarises tested procedures and profiles for two platforms: **Prusa CORE One** (with Nextruder extruder) and **Bambu Lab P1S**. The profiles are not theoretical – they really print and deliver reliable results when a few key rules are followed that make the difference with flex.

## 1. Flexible Portfolio – What Is What

The range includes three flexible materials. They differ in chemical base and hardness, and therefore print differently as well:

- **RubberJet TPE 88** – the softest material (polyolefin / SBS base). Springy, rubber-like, ideal for soft gaskets, damping elements and grips.
- **RubberJet TPE 32** – medium-hard flex (polyolefin / SBS base) with extreme elongation. Suitable for flexible functional parts with high tear resistance.
- **TPU 96** – the hardest and mechanically most resistant flex (thermoplastic polyurethane). For technical and industrial parts – bumpers, couplings, silent blocks, protective covers.

### Note on the Numbers in the Name – They Do Not Reflect Hardness

**The number in the name (88, 32, 96) comes from the production designation of the input material – it is not the measured hardness of the printed object.**

Actual hardness of the printed part per ISO 48-4:2019: TPE 88 → **72.5 Shore A** (softest), TPE 32 → **81 Shore A**, TPU 96 → **88 Shore A** (hardest). Softness thus increases in the opposite direction to what the name would suggest.

### Mechanical Properties (Technical Data Sheet)

| Property | TPE 88 | TPE 32 | TPU 96 |
|---|---|---|---|
| **Hardness – Shore A (printed object)** | 72,5 | 81 | 88 |
| **Hardness – Shore D (printed object)** | 16 | 22 | 38 |
| **Tensile strength (MPa)** | 5,5 | 15 | 55 |
| **Elongation at break (%)** | 300 | 650 | 500 |
| **Tear resistance (N/mm)** | 27 | 41 | 100 |
| **Vicat softening temperature (°C)** | 110 | 110 | 128 |

| Property | TPE 88 | TPE 32 | TPU 96 |
|---|---|---|---|
| **Density (g/cm³)** | 0,8 | 1,1 | 1,15 |
| **Polymer base** | polyolefin/SBS | polyolefin/SBS | TPU |

*Values are taken from the manufacturer's technical data sheet (ISO 1183, ISO 527, ISO 306, ISO 48-4:2019, ISO 37, ISO 34-1). They are intended for part design – for printing, the profile parameters below are decisive.*

## 2. What to Expect from the Profiles – and What Not to

Printing flex is significantly different from standard filaments. The profiles are a reliable starting point for producing flexible parts, but the material itself has its limits.

**Expect:** flexible and tough parts with good layer adhesion, high elongation and chemical resistance. The supplied profiles really print and produce generally solid results.

**Do not expect:** speeds comparable to PLA or PETG, nor perfect fine details. Small features (thin towers, sharp tips, long bridges) are a compromise with flex – the material deflects from the nozzle and cannot hold shape as precisely as rigid plastics. For each part, consider whether it is suitable for the given material.

## 3. Golden Rules for Successful Flex Printing

Before starting your first print, review these rules. Following them is the difference between a functional part and filament tangled under the feed wheel.

### 1) Extruder Mechanics (especially Prusa Nextruder)

On the Bambu Lab, the idler pressure is fixed and the filament path is short – no mechanical adjustment is needed. However, feed the filament from an external holder outside the AMS – flex does not belong in the AMS. On the Prusa CORE One, the idler pressure setting is critical. Too much pressure flattens the soft filament and jams it before the heatbreak; too little leads to slipping and grinding.

**Procedure:** on the CORE One, loosen the idler tension screw **by a maximum of 1 turn from the neutral position**. The goal is light but secure grip. More = slipping, less = compression and jamming.

### 2) Retraction – Short, and Speed According to Platform

Long retractions with flex mean tangling above the feed wheel. However, retraction speed differs by hotend:

- **CORE One (Nextruder):** retraction 0.5 mm at speed **35 mm/s** – fast retraction helps prevent tangling.
- **Bambu P1S:** retraction 0.5–0.8 mm at speed **20 mm/s** – the Bambu hotend handles slower retraction without issues; this is the factory optimum.

*In other words: the value of 20 mm/s, which would cause problems on the Nextruder, is correct on the Bambu. Do not mix rules between platforms.*

### 3) Filament Path and Open Lid on the CORE One

On the CORE One, it is crucial how the filament is routed to the extruder. **Feed TPU directly from above into the extruder if possible, not through the PTFE tube** – it creates friction and drag, the filament feeds poorly and the result is under-extrusion.

**For reliability:** print a spool holder above the CORE One and route the filament from the top. With a bit of luck, TPU may also work from the side, but it is not reliable. TPE printed from the side without issues.

That is why printing on the CORE One is done with the **top lid open** – this allows direct top-feed routing and also prevents heat build-up along the filament path (heat creep), where soft flex begins to swell in the cooler zone and jam.

### 4) Print Speed Slow, Travel Speed Fast

Note the difference between print speed and travel speed – they work in opposite directions:

- **Print speed:** slower is better, ideal **30–50 mm/s**. The main limiting factor is the maximum volumetric speed (MVS), which automatically caps linear speeds.
- **Travel speed:** on the contrary fast, travel at **350 mm/s**. Slow travel increases oozing from the nozzle.

Even with correct settings, expect with flex **higher occurrence of stringing and dots on the bed** – this is a property of the material. Accelerations are not critical for flex and do not need special tuning.

### 5) Extrusion Multiplier – Compression Compensation

Soft filament slightly flattens between the feed wheels, so less material reaches the hotend. That is why the CORE One profiles use an increased extrusion multiplier (1.08 for TPU 96; 1.14 for TPE). On the Bambu P1S, thanks to the short path and automatic calibration, the Flow ratio stays at 1.00.

## 4. Bed Adhesion – The Most Critical Factor for TPE

**TPE DOES NOT ADHERE to a bare satin / textured PEI sheet. Without a release adhesive, the part will detach. This is the most common cause of failure with TPE.**

**Solution: apply a generous coat of Magigoo (2 coats if needed).** Then the part adheres beautifully and prints essentially like normal.

- **TPE 88 / TPE 32:** satin or textured PEI + Magigoo (generous coat, 2× if needed). **Brim is a must** – the larger footprint compensates for the material's softness.
- **TPU 96:** adheres well even without adhesive on a satin / textured sheet. Brim as needed by geometry (recommended for tall and slender parts).

Bed temperature of 50 °C applies to all three materials on both platforms (±5 °C depending on the situation).

## 5. Cooling – Both Material and Platform Matter

Cooling is a crucial parameter for flex and differs both by material and platform. A simple rule applies: **the better the hotend's heating / heat dissipation, the more cooling it can handle and needs.**

- **TPU 96** requires significantly more active cooling than TPE – it has no reinforcement and softens in heat. On the P1S (powerful hotend) the fan runs up to 100%, on the CORE One (Nextruder) only 30–50%.
- **TPE 88 / TPE 32** gets by with minimal cooling – fan constantly at 10%, bridges/overhangs at 20%. More cooling does not benefit TPE.

See the parametric tables below for specific values. Follow them – cooling derived from another material (e.g. a TPU profile applied to TPE) gives poor results.

## 6. Filament Preparation and Drying

Here TPU and TPE behave differently – and it is a practical difference:

- **TPU 96 – dry thoroughly.** It is hygroscopic and wet TPU immediately strings, forms bubbles and has reduced layer strength. Dry at 50–55 °C / 6–8 h, ideally before every print. Do not exceed 55 °C (it sticks to the spool).
- **TPE 88 / TPE 32 – low moisture absorption.** The polyolefin base is hydrophobic, so drying is normally not required. A preventive dry is sufficient only if the spool has been sitting for a long time. Store in a sealed container with desiccant.

## 7. Parameter Tables

Values correspond to the supplied profiles. Temperatures can be adjusted ±5 °C as needed.

### Prusa CORE One

| Parameter | TPU 96 | TPE 88 | TPE 32 |
|---|---|---|---|
| **Nozzle temperature (°C)** | 245 | 240 | 240 |
| **Bed temperature (°C)** | 50 | 50 | 50 |
| **Enclosure** | lid open | lid open | lid open |
| **Extrusion multiplier** | 1,08 | 1,14 | 1,14 |
| **Max. volumetric speed (mm³/s)** | 2 | 3 | 2 |
| **Retraction – distance (mm)** | 0,5 | 0,5 | 0,5 |
| **Retraction – speed (mm/s)** | 35 | 35 | 35 |
| **Fan – normal** | 30–50 % | 10 % | 10 % |
| **Fan – bridges** | 70 % | 20 % | 20 % |
| **Idler (Nextruder)** | loosen 1 turn | loosen 1 turn | loosen 1 turn |
| **Brim** | per geometry | yes | yes |
| **Adhesive** | not needed | Magigoo | Magigoo |

### Bambu Lab P1S

| Parameter | TPU 96 | TPE 88 | TPE 32 |
|---|---|---|---|
| **Nozzle temperature (°C)** | 240 | 240 | 240 |
| **Bed temperature (°C)** | 50 | 50 | 50 |
| **Enclosure** | closed | closed | closed |
| **Flow ratio** | 1,00 | 1,00 | 1,00 |
| **Max. volumetric speed (mm³/s)** | 3 | 3 | 3 |
| **Retraction – distance (mm)** | 0,8 | 0,5 | 0,5 |
| **Retraction – speed (mm/s)** | 20 | 20 | 20 |
| **Fan – normal** | 100 % | 10 % | 10 % |
| **Fan – overhangs/bridges** | 100 % | 20 % | 20 % |
| **Overhang cooling threshold** | 95 % | 25 % | 25 % |
| **Brim** | per geometry | yes | yes |
| **Adhesive** | not needed | Magigoo | Magigoo |

### Shared Speeds (Both Platforms)

| Parameter | Value |
|---|---|
| **Outer perimeters** | 20 mm/s |
| **Perimeters** | 25 mm/s |
| **Infill** | 30 mm/s |
| **Ideal speed range** | do ~50 mm/s |
| **First layer speed** | 15 mm/s |
| **Travel speed** | 350 mm/s |
| **Nozzle** | 0.4 mm standard brass |
| **Layer height** | 0,20 mm |

## 8. Fine-Tuning by Geometry

The profile is a reliable foundation, but the final settings are dictated by the specific part. Most common adjustments:

- **Tall and thin parts:** the flexible material deflects from the nozzle. Reduce speed, add a brim for stability.
- **Overhangs and bridges:** TPE/TPU prints poorly across a gap. Avoid long bridges; design with supports in mind.
- **Gaskets and precise dimensions:** print a calibration sample, measure and fine-tune. Flex has higher shrinkage than rigid materials.
- **Damping elements and silent blocks:** consider 30–50% gyroid infill for better damping – full infill unnecessarily adds stiffness.

- **Production runs:** always verify with a test piece first (dimensions, flex, function), then start the production run.

## 9. Troubleshooting – Quick Diagnosis

| Symptom | What to Check |
|---|---|
| **Part detaches (especially TPE)** | Magigoo – apply generously, 2× if needed; enable brim; bed 50 °C |
| **Filament tangles / grinds under the wheel (CORE One)** | Loosen idler pressure (max 1 turn); route filament from top without bends |
| **Print jams after a few minutes (CORE One)** | Route filament from top (not through PTFE); open top lid; check fan |
| **Under-extrusion / extruder clicking (CORE One)** | Route filament from top – PTFE creates friction; check MVS and nozzle temperature |
| **Stringing, bubbles (mainly TPU)** | Dry filament at 50–55 °C / 6–8 h |
| **Stringing and dots on the bed** | Partly normal with flex; increase travel speed (350 mm/s); verify retraction per platform |
| **Merged details, melted tips** | Slow down only that section; consider whether the geometry is suitable for flex |

## 10. Summary

- **TPE adhesion = Magigoo + brim.** Without adhesive, TPE does not hold on PEI. TPU has good adhesion.
- **Idler – loosen 1 turn (CORE One)** – no more, slipping risk.
- **Filament path (CORE One): TPU from top, not through PTFE** – otherwise under-extrusion. Print with lid open.
- **Retraction: CORE One 35 mm/s, P1S 20 mm/s** – do not mix rules between platforms.
- **Cooling: TPU more, TPE only 10%;** P1S tolerates more aggressive cooling than the Nextruder.
- **Drying: TPU always, TPE only if stored long-term.**
- **Print slow (30–50 mm/s), travel fast (350 mm/s)** – with flex, expect stringing and dots.

*Each profile is a living document. If you find a better combination of parameters for your application, let us know – we are always happy to improve the profiles.*