TPU98A

TPU98A is a specifically formulated flexible filament for easy & high-speed printing on both direct and Bowden style 3D printers. TPU98A does not require the use of a heated bed and can even be printed straight onto (clean) glass. TPU98A is the flexible filament for (semi)professional users who do not want to compromise and require a high mechanical flexible filament that prints easily. TPU98A is an extremely usable flex-filament with a wide variety of different applications such as Orthopedic insoles, Prosthetics, Vibration dampers and much more.

Material features:

- Strong & flexible
- Works on direct & bowden style 3D printers
- Printable at speeds of >75mm/s
- Exceptionally high softening point of 138°C
- 450% elongation at break
- Resistance to oils, greases & microorganisms
- Easily print watertight objects

Colours:

TPU98A is available from stock in 6 colours.

cl1	bk1	wh1	rd1	bu2	pi2

Packaging:

TPU98A is available in nearly any type of packaging and labelling, but will always be supplied in a vacuum bag, due to the moisture sensitivity of TPUs. Ask our team to help you customizing your product.

Filament specs.		
Size	**Ø tolerance**	**Roundness**
1,75mm	± 0,05mm	≥ 95%
2,85mm	± 0,10mm	≥ 95%

Material properties		
Description	**Testmethod**	**Typical value**
Specific gravity	ISO 1183	1,16 g/cc
MFI 210°C/10kg	ISO 1133	57 g/10min
Tensile strength at yield	ISO 527	50 MPa
Elongation strain at break	ISO 527	450%
Tensile (E) modulus	ISO 527	150 MPa
Impact Strength - Charpy method 23°C	ISO 179 1eA	NB
Shore hardness	ISO 7619-1	98A
Printing temp.	Internal method	230±10°C
Melting temp.	ISO 294	225°C
Glass transition (Tg)	ISO 11357	-16°C
Vicat softening temperature	ISO 306	138˚C

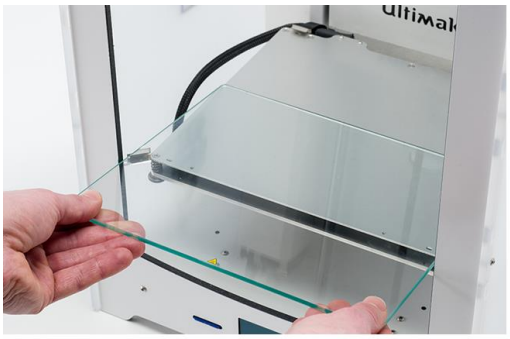
Additional info:

TPU98A does not require a heated bed to stick well though you can set it to ≤60°C for extra reassurance.
TPU98A works superb with a direct drive feeder, or newer types of Bowden FDM or FFF technology 3D printers. By changing the infill / infill / number of walls you can create the perception of a higher / lower shore than 98A. Storage: Cool and dry (15-25˚C) and away from UV light. This enhances the shelf life significantly.
After being out of the bag for several hours, redrying in an oven is recommended to eliminate moisture. See page 4 for the recommended drying time and temperatures.

How to print with TPU98A flexible filament:

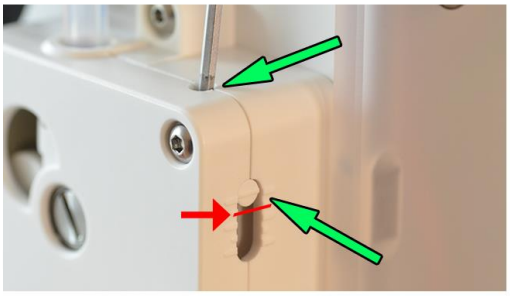
When compared to rigid materials, flexible materials are often more difficult to print. Even though we took great care of making one of the most easily printable flex filaments it is still recommended to read this datasheet in order to better familiarize yourself with the dos and don'ts of flexible 3D printing.

Several factors are extra important for flexible filaments and need to be considered when printing;



Make sure you have a clean glass plate (free of any oils / greases)

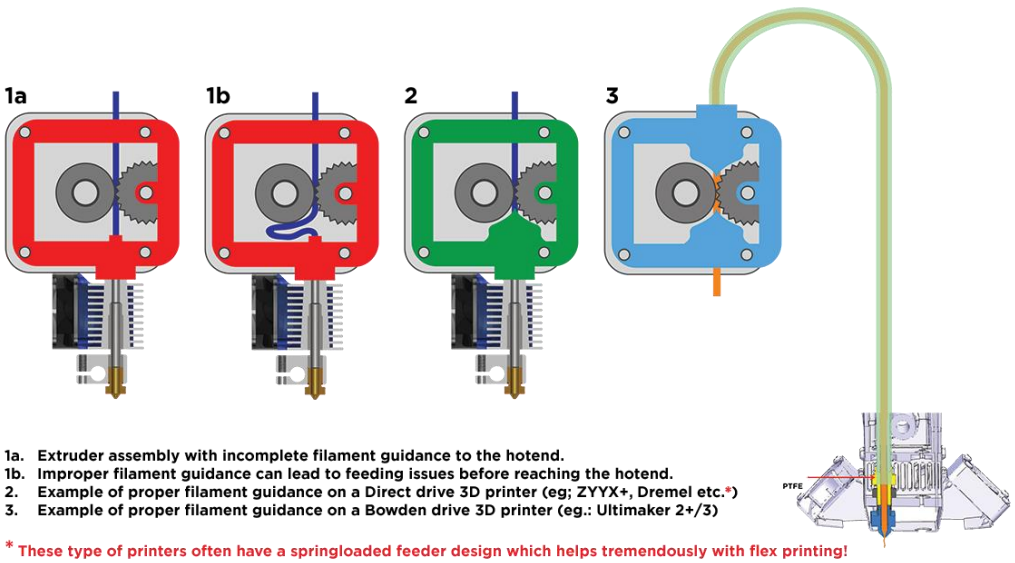
Prepare your plate for the perfect 1st layer by following your 3D printers bed calibration method (make sure to do it properly and maybe even 2 times)



Take care of your tension settings (if possible). This is one of the most important steps for being succesful with flexible filament.
(We recommend the above seting for UM2+ printers)

Check your PTFE (if your printer has this in the hotend) for problems.
(Brown / Crunchy = bad)

Several types of hotends and feeders are available on the market. We will focus on the below mentioned 3 types.



1a. Extruder assembly with incomplete filament guidance to the hotend.
1b. Improper filament guidance can lead to feeding issues before reaching the hotend.
2. Example of proper filament guidance on a Direct drive 3D printer (eg; ZYYX+, Dremel etc.*)
3. Example of proper filament guidance on a Bowden drive 3D printer (eg.: Ultimaker 2+/3)

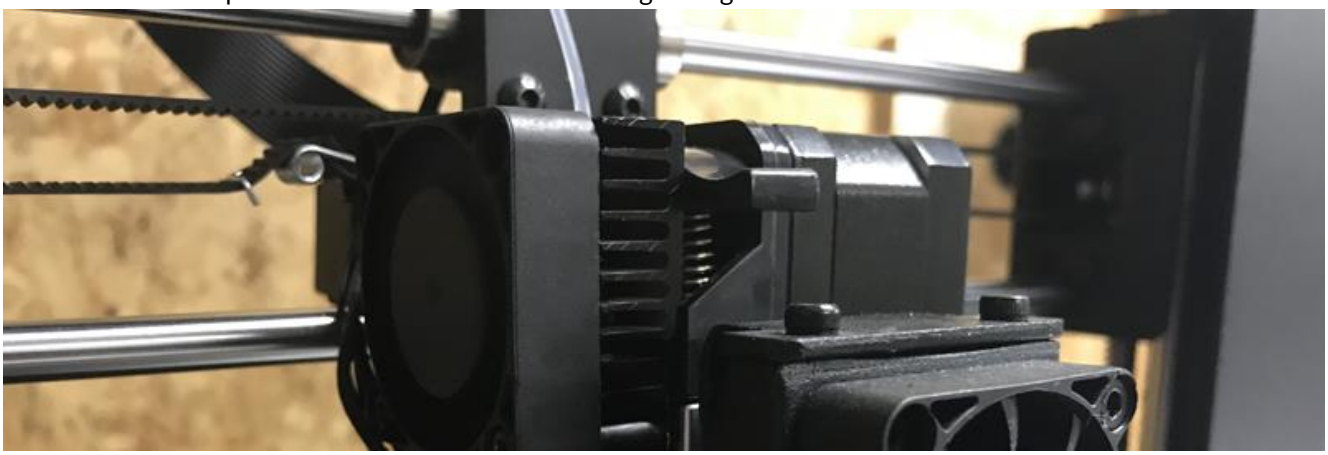
*** These type of printers often have a springloaded feeder design which helps tremendously with flex printing!**

MCPP Netherlands BV recommends to stay away from the 1a/1b setup if possible, in order to avoid printing issues. That does not mean that it is impossible to print with this setup though in practice this means you will have to print slow (30 – 40 mm/s) and will have to spend a decent amount of time on tweaking your print settings & feeder tension.

When properly dialed in TPU98A will print like butter at extremely fast speeds (>75mm/s) on both Direct (2) and Bowden (3) setups. It is still important to spend time on finding the perfect tension settings and temperature settings in order to avoid problems during printing.

Proper tension settings:
Much can be said about accomplishing correct tension settings on your 3D printer. Unfortunately, there is such a wide variety of different systems that it is impossible for us to discuss every specific 3D printer.

In practice most Direct drive printers will feature a spring-loaded system or don't allow for much tweaking of the tension. The recommendation is that you make sure that your feeder has a tight grip on the filament but does not over-compress the filament which can cause grinding of the filament.



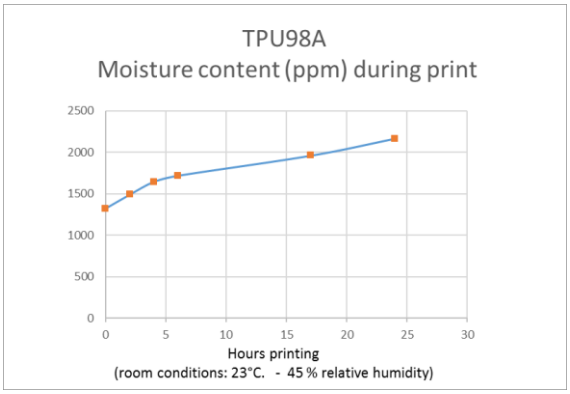
Example of a spring-loaded direct drive

For Bowden drive printers it is crucial that you have either a 2 or 3 type setup which are more "filament restricting" and will increase your chance at successful prints. The recommendation for the tightness of the feeder on a Bowden drive printer is basically the same as a direct drive printer.

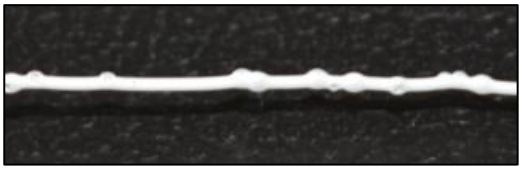
A surprising example of what can go wrong when you don't have the right feeder for printing flexible filament.

How does moisture sensitivity impact TPU98A?
TPU98A is very hygroscopic material. This means that it attracts moisture from the air which can have a negative impact on the printing performance. After printing, it is strongly recommended to place the spool into a vacuum bag (without any silica*) for storage. TPU98A will be delivered with a moisture content of less than 2000PPM (Parts Per Million) or 0,2%. It is delivered in a aluminium vacuum sealed bag that prevent any moisture from getting to the filament.

Our testing shows that with a moisture content of lower then 2000ppm, a full 24 hours print can be achieved without any problems.



Filament moisture content over time



Example of a very 'wet ´ filament with moisture bubbles after extrusion

When is TPU98A too wet to print?
If the TPU98A is too wet, this can be evaluated visually:
- Heat the nozzle to the preferred temperature for your printer.
- Extrude or push the filament through the nozzle.

Tiny bubbles appearing when the filament is coming out of the nozzle indicates expanding moisture and can cause unwanted printing effects.

When a clear filament is not perfectly clear after extruding, and has milky white streaks through it, it is also too wet to print.

What to do when TPU98a is too wet to print?
TPU98A attracts moisture. After every print it is recommended to dry the filament before the next print.

The formula for drying TPU98A is easy;
*- After a 24-hour print put it into a standard HEATED AIR oven or filament dryer** at 65°C for 24 hours*
- After an 8-hour print, put the filament into the oven for 8 hours.
- After a 2-hour print, put the filament into the oven for 2 hours.

This will be enough to dry the TPU98A to moisture levels in order to have the best printing results.

If, for some reason, your spool has been open for days, it will take more time to dry it back to proper moisture levels.

Example of TPU98A drying in a so called "PrintDry filament dryer"

* Often silica gel sachets contain a higher ppm moisture content than the filament itself which would have a reversed effect.
** If you have a Printdry filament dryer, the perfect way to print TPU98A is directly from the Printdry.
All tests and data have been generated in the R&D lab at a constant 23°C and 45-50% RH and are based on 500-gram spools.