Ultem™ AM1010F

This filament is based on a Polyetherimide raw material; it is an amorphous material, and ones of the most resistant polymers available for FFF machines.

Due to its high mechanical, thermal and chemical properties, it can be used for high-end components, like structural components, heat exchanger and so on.

This material has FAA certification, and that signify that can be used for aerospace uses.

It's also has auto extinguishing properties, so it's UL94 compliant.

Suggested use

Functional parts	
Automotive industry	
Aerospace Industry	
Chemical industry	

Compatibilities

Support compatibility	SSU07 (Break-Away)
Material compatibility	

Easy profiles suggested

Layer	Ø 0.3 mm	Ø 0.4 mm	Ø 0.6mm	Ø 0.8 mm
0.10		*		
0.15		**		
0.20		**		
0.25		*		
0.30				
0.40				
0.50				

** : Recommended
* : Discrete quality

Before printing

Drying	Dying before and during the job. 115 °C for 4-5 h is recommended
Cleaning	It's suggested to clean the bed with IPA before print
Extruder	HI-TEMP
Nozzle	Standard
SPFU	Not compatible

General advice

Massive parts and/or high infill density can cause deformation and warping. For this reason, it' recommended to use *brim* (with *latch*) and *inflate support* functions.

*Physical properties**

Propriety	Symbol	Standard	Value
Density	ρ	ISO 1183	1.29 g/cm^3
Water absorption	w_w	N.A.	

*Thermal properties**

Propriety	Symbol	Standard	Value
Melting flow index	M. F. I.	ISO 1133	14g/10 min
Glass transition temperature	T_g	ISO 11357	209 °C
Temperature deflection under load	T_f 1,8	ASTM D 648	215 °C
Vicat softening temperature	VST B50	ISO 306 50 °C/min	N/A
Coefficient of linear thermal expansion	α	ISO 11359	N/A
Flammability		UL94	V0

*Electrical properties**

Propriety	Symbol	Standard	Value
Surface resistivity	σ_e	N.A.	N.A.
Electric strength	E_B	N.A.	N.A.

* values provided by polymer supplier

Mechanical properties

Based on layer-by-layer deposition, additively manufactured parts, especially with the FDM technique, present a not negligible anisotropy on mechanical properties.

The user must think about the correct displacement of the part in the machine for maximize its mechanical properties.

For this reason, we report the mechanical properties of our specimens considering the three main orientations, by plane x-y (flat), by plane y-z (on edge), and by plane z-x (upright).

All specimens are made with the same printing conditions:

- Infill: 100%
- Nozzle: 0,4 mm
- Layer thickness: 0.2 mm
- Raster angle: 45 °

For more information about the test and specimens' conditions, we suggest checking the ISO references that are reported in the following tables.

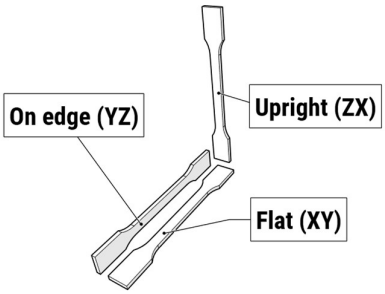


Figure 1: specimen displacement to determine tensile properties (ref. ISO 527-2)

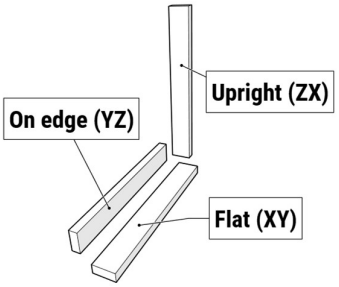
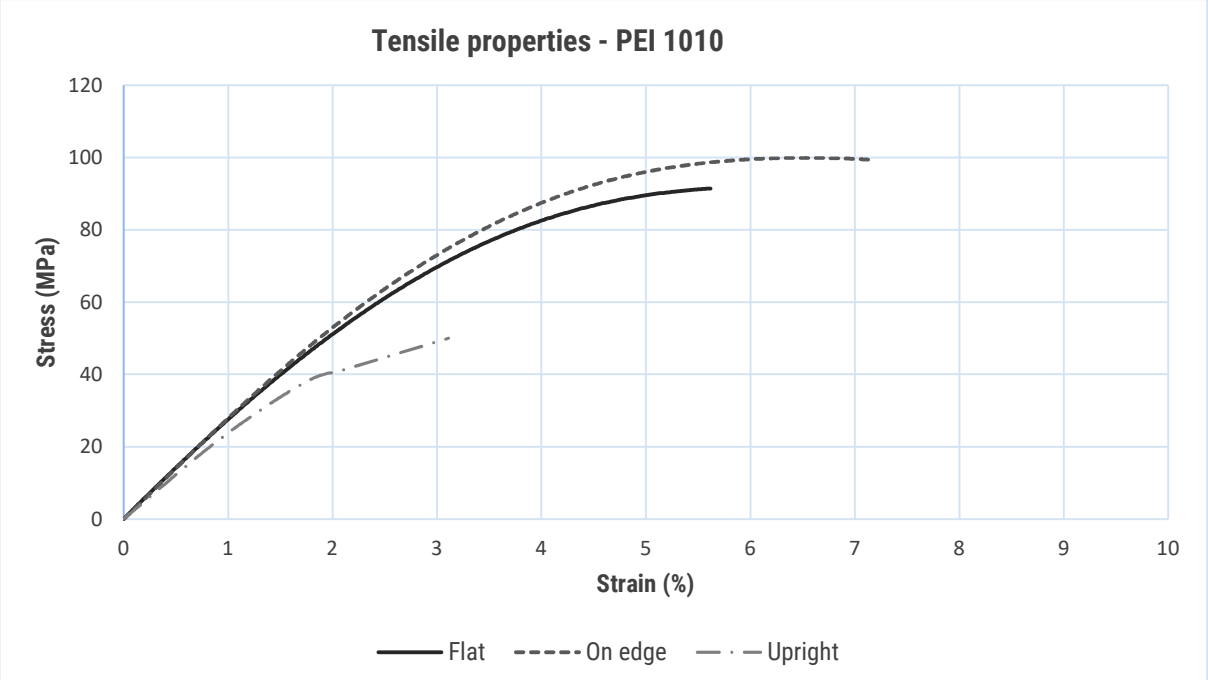


Figure 2: specimen displacement to determine flexural and impact properties (ref. ISO 178 and 179-1)

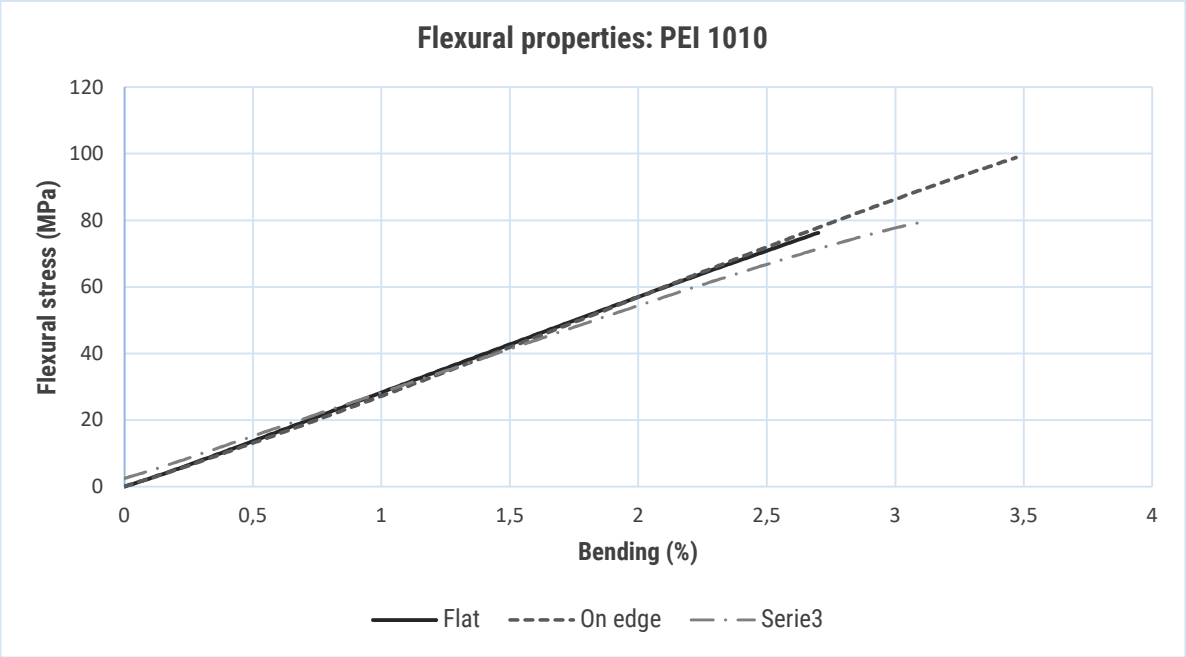
Tensile properties

Propriety	Symbol	Standard	Specimens build direction	Value
Tensile modulus	E_t	ISO 527-2	Flat	2910 MPa
			On edge	2603 MPa
			Upright	2512 MPa
Yield stress	σ_y		Flat	No Yield
			On Edge	No Yield
			Upright	No Yield
Yield strain	ε_y		Flat	No Yield
			On Edge	No Yield
			Upright	No Yield
Strength at break	σ_b		Flat	91 MPa
			On Edge	100 MPa
			Upright	52 MPa
Strain at break	ε_b		Flat	5.6 %
			On Edge	7.1 %
			Upright	3.1 %



Flexural properties

Propriety	Symbol	Standard	Specimens build direction	Value
Flexural modulus	E_f	ISO 178	Flat	2351 MPa
			On edge	2246 MPa
			Upright	2360 MPa
Flexural strength	σ_{fC}		Flat	75 MPa
			On Edge	98 MPa
			Upright	80 MPa



Impact properties

Propriety	Symbol	Standard	Specimens build direction	Value
Charpy unnotched impact strength	a_{cu}	ISO 179	Flat	105 kJ/m2
			On edge	115 kJ/m2
			Upright	12 kJ/m2
Type of failure	ToF		Flat	Comp. Break
			On Edge	Partial Break
			Upright	Comp. Break

Chemical stability

Substance	Resistance
Weak acids (3<pH<6)	*b*
Strong acids (pH<3)	*c*
Weak Bases (8<pH<10)	*a*
Strong Bases (pH>10)	*b*
Sea Water	*a*
Aliphatic hydrocarbons	*b*
Aromatic hydrocarbons	*a*
Halogenated hydrocarbons	*c*
Alcohol	*b*
Esters	*b*
Lubricants oils	*b*
Fuel oils	*b*
Fuels	*a*
Coolants	*a*

a= excellent b= good c= limited d= poor

The fine print

The information and values listed into this document are provided in good faith, based on specimens printed with 3ntr machines according to the latest version of SSI print parameters valid at the date of issuance.

3ntr provides you with this information for your guidance to select the correct polymer and setup but user is responsible for determining that 3ntr material is safe, technically correct and legal for the selected application.

The values listed in this documents are not meant for design specification or quality control guidelines: is it user responsibility to design parts with appropriate safety margins to comply with any material variation due part design, production, test conditions, use conditions.

The user has also the responsibility to assess the suitability of the product to the selected use, built with part(s) made with 3ntr materials and/or technologies.

3ntr is not responsible for any warranty about suitability, merchantability or fitness of any part manufactured with 3ntr materials and/or technologies.

3ntr is not responsible for any patent infringement from use of any part printed with 3ntr materials and/or technologies.

The user is responsible for proper use and disposal or recycling of the material(s) listed here according to local laws and regulations.