Nylon +

It is a medium flexible polymer (PA6) achieving a good impact resistance. A great alternative to ABS, as mechanical properties, and ease printing, but with the advantage of using a polyamide; excellent stability during the printing phase, allows to obtain high performance parts rather easily

Ideal for all applications where it is necessary to combine mechanical and chemical resistance.

The thermal resistance is very good as well as its impact resistance. Poor, however, is its resistance to UV and is partially soluble in organic solvents and hydrocarbons. Cyano-acrylic glues tend to accelerate the aging of the piece; in-stead, the epoxy and polyurethane glues are recommended.

The product must be kept scrupulously dry.

Suggested use

Prototypes	Multi-material applications
Fit and assembly	Final parts
Mech tests	Spare parts
Tools	MRO
Jig and fixtures	

Compatibilities

Support compatibility	SSU04 (Soluble in hot water)
	SSU09 (Soluble with WAVE powder[1])
Material compatibility	Elasto 85, Elasto 95
	Carbon +
	Glass +

[1] The SSU09 support is degradable with an alkaline solution obtained by WAVE powder; the proportion of 170 g of powder per 7 liters of water is recommended. We recommend the use of an ultrasonic tank and water at 70 °C.

Easy profiles suggested

- Minimum infill: 25 %

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. 90 °C for 4-5 h are recommended
Cleaning	It's suggested to clean the bed with IPA before print
Print directly on Veltra bed	Feasible but brim is recommended
Extruder	HI-TEMP
Nozzle	Standard
SPFU	Not compatible

General advice

In the case of thin part, Nylon + tends to deform over time, especially if placed in humid and hot environments.

An increase in skin thickness or high filling density can cause deformations of the piece during the printing phase.

*Physical properties**

Propriety	Symbol	Standard	Value
Density	ρ	ISO 1183-1	1.14 g/cm^3
Water absorption	w_w	DIN 16742	< 0.3 %

*Thermal properties**

Propriety	Symbol	Standard	Value
Melting flow index	M. F. I.	ISO 1133	5.1 g/10 min
Glass transition temperature	T_g	ISO 11357	49 °C
Temperature deflection under load	T_f 1,8	ISO 75-2	90 °C
Continuous service temperature (20.000 h)	–	IEC 60216	120 °C
Coefficient of linear thermal expansion	α	ISO 11359	N/A
Flammability		UL94	N/A

*Electrical properties**

Propriety	Symbol	Standard	Value
Surface resistivity	σ_e	DIN IEC 60167	> 10^{12} Ω
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.

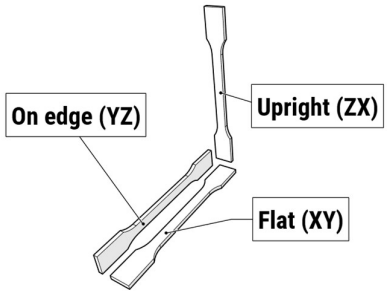


Figure 1: specimen displacement to determine tensile properties (ref. ISO 527-2)

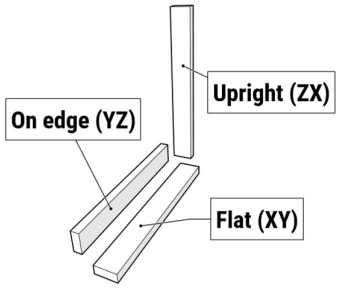
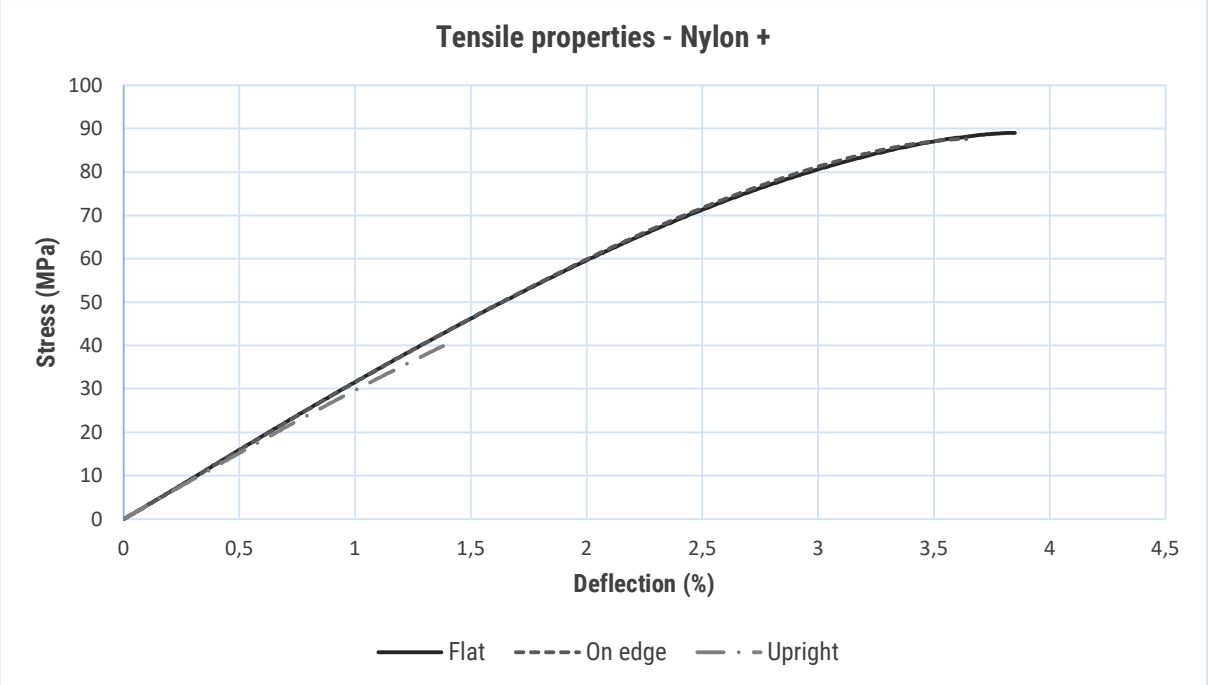


Figure 2: specimen displacement to determine flexural and impact properties (ref. ISO 178 and 179-1)

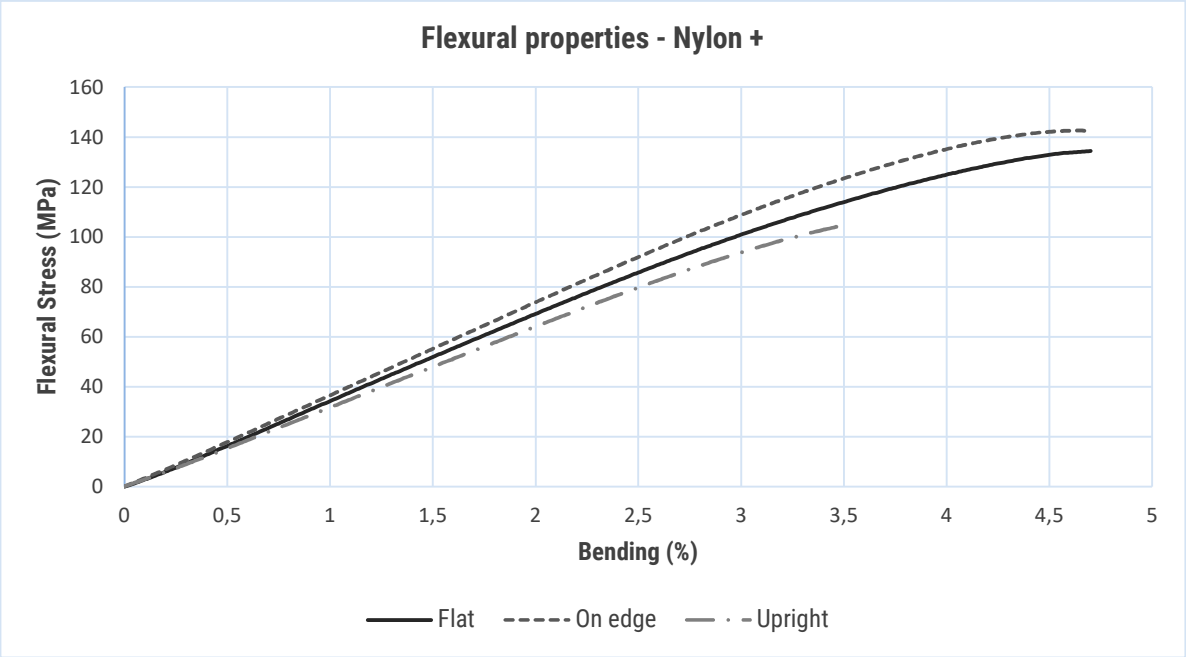
Tensile properties

Propriety	Symbol	Standard	Specimens build direction	Value
Tensile modulus	E_t	ISO 527-2	Flat	3179 MPa
			On edge	3134 MPa
			Upright	3020 MPa
Yield stress	σ_y		Flat	89.6 MPa
			On Edge	No Yield
			Upright	No Yield
Yield strain	ε_y		Flat	4.0 %
			On Edge	No Yield
			Upright	No Yield
Strength at break	σ_b		Flat	88 MPa
			On Edge	88 MPa
			Upright	40 MPa
Strain at break	ε_b		Flat	3.9 %
			On Edge	3.7 %
			Upright	1.4 %



Flexural properties

Propriety	Symbol	Standard	Specimens build direction	Value
Flexural modulus	E_f	ISO 178	Flat	3159 MPa
			On edge	3471 MPa
			Upright	3033 MPa
Flexural strength	σ_{fC}		Flat	114 MPa
			On Edge	124 MPa
			Upright	105 MPa



Impact properties

Propriety	Symbol	Standard	Specimens build direction	Value
Charpy unnotched impact strength	a_{cu}	ISO 179	Flat	22 kJ/m^2
			On edge	40 kJ/m^2
			Upright	10 kJ/m^2
Type of failure	ToF		Flat	Comp. Break
			On Edge	Comp. Break
			Upright	Comp. Break

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.