NP Carbon

NP Carbon is based on a Polyphenylene sulfide (PPS) blend reinforced with about 20 % chopped carbon fiber.

It's a semicrystalline material, with high thermal (higher than the not reinforced ones) and chemical resistance (can handle strong acid/basis and hydrocarbons). It can be considered an alternative to PEEK when very high mechanical properties are not required.

Suggested use

Automotive	
Chemical	
Oil & Gas	
Nuclear	
ESD parts	

Compatibilities

Support compatibility	SSU05 (break-away)
Material compatibility	nPower
	Elasto 95 HT

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	Gentle drying (55 °C) before and during the job is 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	BLISS
SPFU	Not compatible

General advice

In the case of supported parts, it is suggested to inflate supports to increase the adhesion and ensure the reliability of the job.

Large objects and/or with high infill percentages printed with NP Carbon, can present deformation and warping. For this reason, brim and inflate support are suggested.

*Physical properties**

Propriety	Symbol	Standard	Value
Density	ρ	ISO 1183	1.33 g/cm^3
Water absorption	w_w	ISO 62	< 0.07

*Thermal properties**

Propriety	Symbol	Standard	Value
Melting flow index	$M.F.I.$	ISO 1133	N/A
Glass transition temperature	T_g	//	N/A
Temperature deflection under load	T_f 1,8	ISO 75 Unannealed	220 °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	DIN IEC 60093	≤ 10^3
Electric strength	E_B	DIN IEC 60167	≤ 10^5

* 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.

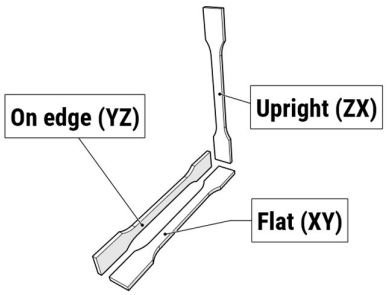


Figure 1: specimen displacement to determine tensile properties (ref. ISO 527-2)

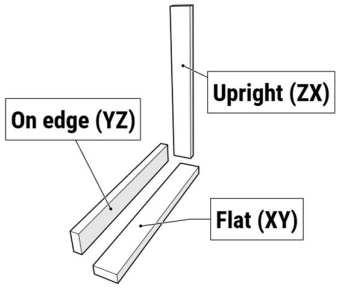
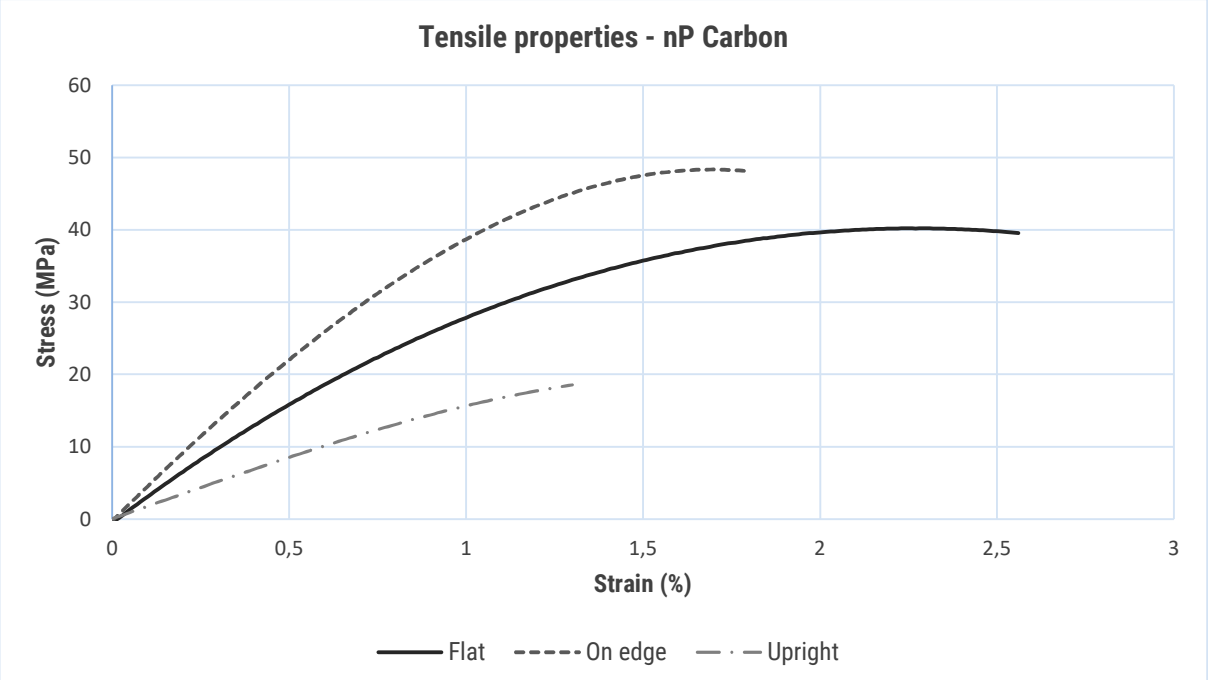


Figure 2: specimen displacement to determine flexural and impact properties (ref. ISO 178 and 179-1)

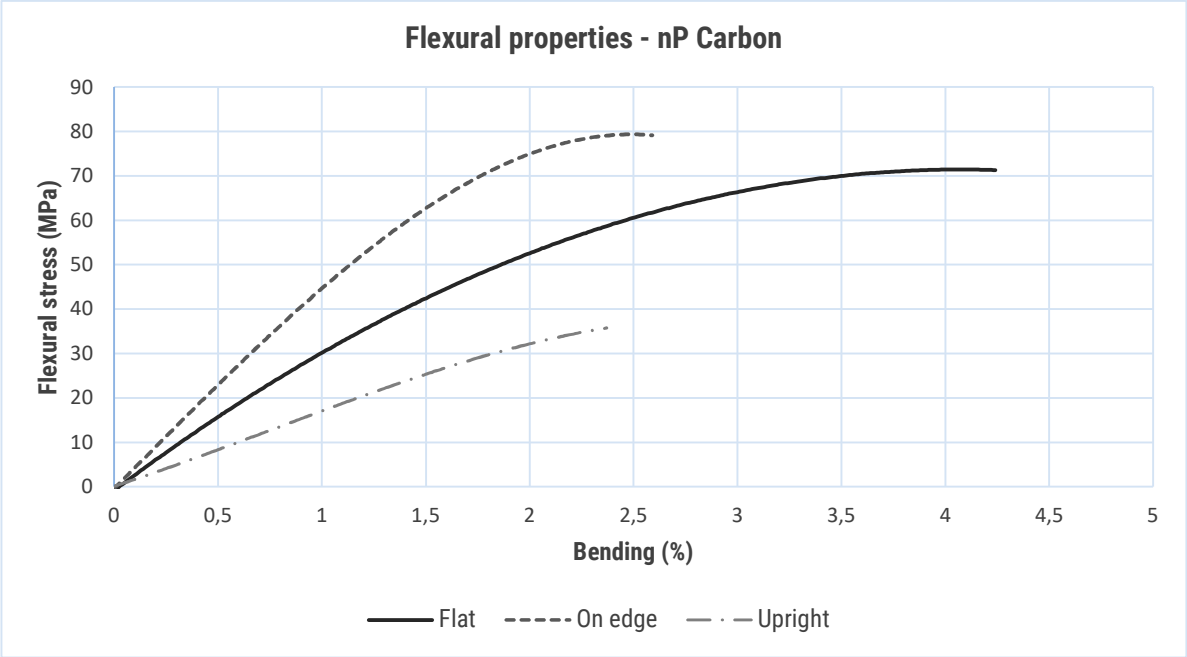
Tensile properties

Propriety	Symbol	Standard	Specimens build direction	Value
Tensile modulus	E_t	ISO 527-2	Flat	3123 MPa
			On edge	4506 MPa
			Upright	1722 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	41 MPa
			On Edge	49 MPa
			Upright	19 MPa
Strain at break	ε_b		Flat	2.6 %
			On Edge	1.8 %
			Upright	1.3 %



Flexural properties

Propriety	Symbol	Standard	Specimens build direction	Value
Flexural modulus	E_f	ISO 178	Flat	2891 MPa
			On edge	4486 MPa
			Upright	1618 MPa
Flexural strength	σ_{fB}		Flat	71 MPa
			On Edge	78 MPa
			Upright	36 MPa



Impact properties

Propriety	Symbol	Standard	Specimens build direction	Value
Charpy unnotched impact strength	a_{cu}	ISO 179	Flat	16 kJ/m^2
			On edge	17 kJ/m^2
			Upright	5 kJ/m^2
Type of failure	*ToF*		Flat	Comp. Break
			On Edge	Hinge Break
			Upright	Comp. Break

Chemical stability

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

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