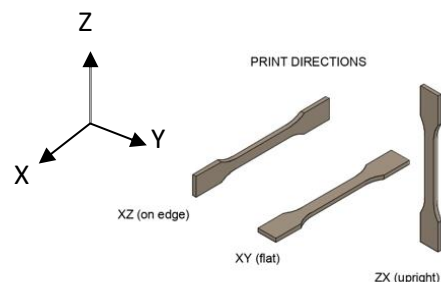


General Information

TenneT Vulcan PI
Material class: Polyimide

Product Highlights

- Highest Z-strength
- Inherent flame retardant
- Easy to print Polyimide
- Material meets EN45545-2 with HL1/2/3 according to requirements R22/R23



Property	Method	Units	Value		
* Print orientation -45°/45°			XY (flat)	XZ (on edge)	ZX* (upright)
Mechanical properties					
Tensile Strength *	ISO 527 Type 1BA	MPa	83	89	68
Tensile Modulus*	ISO 527 Type 1BA	GPa	2.73	2.89	2.56
Strain at Break *	ISO 527 Type 1BA	%	4.8	4.8	3.5
Tensile Strength **	ISO 527 Type 1BA	MPa	-	100	54
Tensile Modulus **	ISO 527 Type 1BA	GPa	-	2.87	2.42
Strain at Break **	ISO 527 Type 1BA	%	-	5.4	2.6
Tensile Strength ***	ASTM 1708	MPa	-	-	96
Tensile Modulus***	ASTM 1708	GPa	-	-	2.29
Strain at Break ***	ASTM 1708	%	-	-	4.88
Impact Strength Izod (notched) **	ISO 180	KJ/m ²	5.3	5.3	4.3
Impact Strength Izod (unnotched) **	ISO 180	KJ/m ²	29	28	26
Thermal properties					
Flammability 0,75 mm	UL 94	-	-	-	-
Flammability 1,6 mm	UL 94	-	-	-	-
Melting point	DMA	°C	-		
Glass transition temperature (Tg)	DMA	°C	195		
Temp. of deflection under load (1.80 MPa) *	ISO 75-1/-2	°C	167		
Temp. of deflection under load (0.45 MPa) *	ISO 75-1/-2	°C	175		

* Printed flat on bed representing XY (90°C Chamber)

** XZ/ZX Bars cut out of 3D printed plates on edge and in Z direction printed according to guidelines

*** Single wall data on Z-strength printed according to guidelines

Standardized Technical data sheet

Property	Method	Units	Value	
Thermal properties				
* Print orientation -45°/45°			XY* Flat	XZ (on edge) and ZX (upright)
CTE (-45/45 infill) -50 °C to 60 °C	ASTM 831	ppm/°C	43.05	46.64
	ASTM 831	ppm/°F	23.92	25.91
CTE (-45/45 infill) 60°C to 120 °C	ASTM 831	ppm/ °C	53.95	58.52
	ASTM 831	ppm/°F	29.97	32.51
CTE (-45/45 infill) 120 °C to 190 °C	ASTM 831	ppm/ °C	62.51	67.74
	ASTM 831	ppm/°F	34.73	37.63
CTE (90° XZ infill) -50 °C to 60 °C	ASTM 831	ppm/ °C	50.15	44.68
	ASTM 831	ppm/°F	27.86	24.82
CTE (90° XZ infill) 60°C to 120 °C	ASTM 831	ppm/ °C	61.07	58.30
	ASTM 831	ppm/°F	33.92	32.38
CTE (90° XZ infill) 120 °C to 190 °C	ASTM 831	ppm/ °C	68.64	65.23
	ASTM 831	ppm/°F	38.13	36.23
Td at 1% loss	DMA	°C	343	
Td	DMA	°C	460	

Property	Method	Units	Value	
Flame Characteristics*				
Smoke opacity	ISO 5659-2 25kW/m²	-	$D_s(4)$	0.7
			VOF ₄	0.8
			Dm	80.6
Limit Oxygen Index	ISO 4589-2	-	CIT _{NLP}	0.45
Smoke Toxicity	NF X 70- 100	-	ILO % O^2	32.6

* Tecton PI was printed in XY orientation (4mm thick) and tested according EN45545-2. These tests show that this material meets the requirements for:

R22 HL1/2/3 XY orientation 4 mm thickness
R23 HL1/2/3 XY orientation 4 mm thickness



Property	Method	Units	Value
Physical properties			
Filament diameter (+/- 0,05mm)	-	mm	1.75
Density	ISO 1183-1	g/cm3	1.51
Electrical properties			
Dielectric constant (1GHz)	ASTM D150	-	2.87
Dielectric constant (10GHz)	ASTM D150	-	2.85
Dielectric loss (1GHz)	ASTM D150	-	0.0094
Dielectric loss (10GHz)	ASTM D150	-	0.0083
Breakdown voltage	ASTM D149	MV/m	172

Recommended Processing conditions	
Nozzle temperature	Recommended: 405°C (390°C - 410°C)
Bed temperature	Recommended: 160°C (120°C - 160°C)
Chamber temperature	Recommended: 160°C (80°C - 160°C)
Bed material	Glass, PEI Sheet, Carbon plate
Adhesion promoter	Magigoo HT, Nano Polymer Adhesive, GeckoTec EZ-Hot
Nozzle diameter	≥ 0.4 mm, Ruby or Hardened recommended
Print speed	Recommended 30 mm/s (15-150 mm/s)
Drying instructions filament	120°C, 4-8 Hours

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