Toray Cetex® TC1200 PEEK

Toray Advanced Composites

PRODUCT DATA SHEET

DESCRIPTION

Toray Cetex® TC1200 is a high-end thermoplastic composite material, utilizing the semi-crystalline thermoplastic polymer PEEK for excellent mechanical performance.

The long-standing use of PEEK in demanding applications such as aerospace and cutting edge medical applications proves its benefits and versatility. As a composite material it offers outstanding mechanical performance, also at elevated temperatures. The semi-crystalline nature of the resin ensures an excellent resistance to chemicals and solvents, and an equally superior performance in flammability properties.

Toray Cetex® TC1200 is available in UD tape, fabric prepreg, and RTL formats (reinforced thermoplastic laminate). RTLs can be equipped with lightning strike protection, and carbon reinforced RTLs can be supplied with a thin glass top layer to protect a partly metallic assembly against galvanic corrosion. Glass scrim is also applicable in structures made from UD tape.

FEATURES

- **Excellent toughness and impact resistance**
- **Excellent mechanical performance, also at elevated temperatures**
- **Low moisture uptake for good hot/wet strength retention**
- **Fully impregnated low void content unidirectional tapes for robust processing**
- **Inherently flame retardant**
- **Outstanding chemical and solvent resistance**
- **Indefinite shelf life at ambient temperature storage**

PRODUCT TYPE

PEEK (PolyEtherEtherKetone) Thermoplastic Resin System

TYPICAL APPLICATIONS

- Primary and secondary aircraft structure
- Structural aircraft interiors applications
- Access panels, rib stiffeners, brackets, conduit, flooring
- Medical
- Oil and gas

SHELF LIFE

Out Life:	Indefinite at ambient temperature storage
Frozen Storage Life:	Not applicable—product does not require freezing

TYPICAL NEAT RESIN PROPERTIES

Density (specific gravity)	1.30 g/cm³ (81.2 lb/ft³)
T_g (glass transition)	143°C (289°F)
T_m (melt)	343°C (649°F)
T_c (crystallinity)	290°C (554°F)
T_p (processing)	370–400°C (700–750°F)

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PHYSICAL PROPERTIES

Property	5 Harness Satin (T300JB Carbon Woven Prepreg)	Standard Modulus Carbon UD Tape	Intermediate Modulus Carbon UD Tape	S2-Glass UD Tape
Fiber areal weight (FAW)	281 g/m² (8.26 oz/yd²)	145 g/m² (4.28 oz/yd²)	145 g/m² (4.28 oz/yd²)	204 g/m² (6.02 oz/yd²)
Weight per ply (PAW)	489 g/m² (14.42 oz/yd²)	221 g/m² (6.52 oz/yd²)	221 g/m² (6.52 oz/yd²)	310 g/m² (9.14 oz/yd²)
Resin content by weight (RC)	42%	34%	34%	29%
Consolidated ply thickness (CPT)	0.31 mm (0.0122")	0.14 mm (0.0055")	0.14 mm (0.0054")	0.15 mm (0.0058")
Density	1.53 g/cm³ (95.51 lb/ft³)	1.59 g/cm³ (99.3 lb/ft³)	1.59 g/cm³ (99.3 lb/ft³)	1.97 g/cm³ (123 lb/ft³)
Width	1270 mm (50")	305 mm (12")*	305 mm (12")*	152 mm (6")*

*Narrower widths are available through secondary slitting
For the availability of other reinforcements, please contact Toray Advanced Composites

MECHANICAL PROPERTIES

Standard Modulus T300JB 3K Carbon 281gsm FAW 5HS Woven Fabric Reinforced Laminate 42% RC				
Property	**Condition**	**Test Method**	**Results**	
Tensile Strength 0°	RTD	ISO 527-4 (type 3)	776 MPa	113 ksi
Tensile Modulus 0°	RTD	ISO 527-4 (type 3)	56.1 GPa	8.1 Msi
Tensile Strength 90°	RTD	ISO 527-4 (type 3)	839 MPa	122 ksi
Tensile Modulus 90°	RTD	ISO 527-4 (type 3)	57.3 GPa	8.3 Msi
Tensile Strength 0°	CD[2]	ISO 527-4 (type 3)	804 MPa	117 ksi
Tensile Modulus 0°	CD[2]	ISO 527-4 (type 3)	57.8 GPa	8.4 Msi
Compression Strength 0°	RTD	AITM 1-0008, type A	585 MPa	85 ksi
Compression Strength 90°	RTD	AITM 1-0008, type A	595 MPa	86 ksi
Compression Strength 0°	HD[3]	AITM 1-0008, type A	590 MPa	86 ksi
In-Plane Shear Strength ±45°	RTD	AITM 1-0002	155 MPa	22 ksi
In-Plane Shear Modulus ±45°	RTD	AITM 1-0002	4.5 GPa	0.7 Msi
In-Plane Shear Strength ±45°	CD[2]	AITM 1-0002, issue 3	171 MPa	25 ksi
In-Plane Shear Modulus ±45°	CD[2]	AITM 1-0002, issue 3	5.2 GPa	0.7 Msi
In-Plane Shear Strength ±45°	HD70[4]	AITM 1-0002, issue 3	147 MPa	21 ksi
In-Plane Shear Modulus ±45°	HD70[4]	AITM 1-0002, issue 3	4.2 GPa	0.6 Msi
In-Plane Shear Strength ±45°	HD[3]	AITM 1-0002, issue 3	140 MPa	20 ksi
In-Plane Shear Modulus ±45°	HD[3]	AITM 1-0002, issue 3	3.9 GPa	0.6 Msi
In-Plane Shear Strength ±45°	HD120[5]	AITM 1-0002, issue 3	128 MPa	19 ksi
In-Plane Shear Modulus ±45°	HD120[5]	AITM 1-0002, issue 3	2.9 GPa	0.4 Msi

50% fiber by volume (Vf)

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Standard Modulus T300JB 3K Carbon 281gsm FAW 5HS Woven Fabric Reinforced Laminate 42% RC				
Property	**Condition**	**Test Method**	**Results**	
Plain Tensile Strength	RTD	AITM 1-0007, issue 3	578 MPa	84 ksi
Plain Tensile Modulus	RTD	AITM 1-0007, issue 3	40.8 GPa	5.9 Msi
Open-Hole Tensile Strength	RTD	AITM 1-0007, issue 3	281 MPa	41 ksi
Filled-Hole Tensile Strength	RTD	AITM 1-0007, issue 3	319 MPa	46 ksi
Plain Compression Strength	RTD	AITM 1-0007, issue 5	459 MPa	67 ksi
Plain Compression Strength	HD[3]	AITM 1-0007, issue 5	437 MPa	63 ksi
Open-Hole Compression Strength	RTD	AITM 1-0007, issue 5	288 MPa	42 ksi
Open-Hole Compression Strength	HD[3]	AITM 1-0007, issue 5	263 MPa	38 ksi
Filled-Hole Compression Strength	RTD	AITM 1-0007, issue 5	467 MPa	68 ksi
Filled-Hole Compression Strength	HD[3]	AITM 1-0007, issue 5	408 MPa	59 ksi
Compression After Impact Strength 40 J (354 in/lb) Impact Energy	RTD	AITM 1-0010, issue 3	265 MPa	38 ksi
Bolt Bearing 2% Strength	RTD	AITM 1-0009, issue 3	795 MPa	115 ksi
Bolt Bearing 2% Strength	HD[3]	AITM 1-0009, issue 3	714 MPa	104 ksi
Bolt Bearing Ultimate Strength	RTD	AITM 1-0009, issue 3	884 MPa	128 ksi
Bolt Bearing Ultimate Strength	HD[3]	AITM 1-0009, issue 3	766 MPa	111 ksi
Bolt Bearing Ultimate Strength	ETW[1]	AITM 1-0009, issue 3	814 MPa	118 ksi

50% fiber by volume (Vf)
[1]ETW is tested at 80°C (176°F)/dry after 1000 hours of conditioning at 70°C (158°F)/85% RH
[2]CD is tested at -55°C (-67°F)/dry
[3]HD is tested at 90°C (194°F)/dry
[4]HD70 is tested at 70°C (158°)/dry
[5]HD120 is tested at 120°C (248°F)/dry

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Standard Modulus Carbon 145gsm FAW UD Tape Laminate 34% RC				
Property	**Condition**	**Test Method**	**Results**	
Tensile Strength 0°	RTD	ASTM D 3039	2410 MPa	350 ksi
Tensile Modulus 0°	RTD	ASTM D 3039	135 GPa	19.5 Msi
Tensile Strength 90°	RTD	ASTM D 3039	86 MPa	12.5 ksi
Tensile Modulus 90°	RTD	ASTM D 3039	10 GPa	1.4 Msi
Compressive Strength 0°	RTD	ASTM D 6641	1300 MPa	189 ksi
Compressive Modulus 0°	RTD	ASTM D 6641	124 GPa	18 Msi
Compressive Strength 0°	ETW[1]	ASTM D 6641	1210 MPa	176 ksi
Compressive Modulus 0°	ETW	ASTM D 6641	121 GPa	17.6 Msi
In-Plane Shear Strength ±45°	RTD	ASTM D 3518	152 MPa	22 ksi
In-Plane Shear Modulus ±45°	RTD	ASTM D 3518	5.2 GPa	0.75 Msi
Flexural Strength 90°	RTD	ASTM D 7264	152 MPa	22.0 ksi
Interlaminar Shear Strength (SBS) 0°/90°	RTD	ASTM D 2344	96.5 MPa	14 ksi
Open-Hole Tensile Strength	RTD	ASTM D 5766	386 MPa	56 ksi
Open-Hole Compressive Strength	RTD	ASTM D 6484	320 MPa	46 ksi
Compression After Impact Strength 30.5 J (270 in/lb) Impact Energy	RTD	ASTM D 7137	303 MPa	44 ksi
Mode I Interlaminar Fracture Toughness (G_{IC} Strain Energy Release Rate)	RTD	ASTM D 5528	1.6 kJ/m²	9.0 in-lb/in²
Mode II Interlaminar Fracture Toughness (G_{IIC} Strain Energy Release Rate)	RTD	ASTM D 7905	2.3 kJ/m²	13.0 in-lb/in²

Fiber type AS4D
59% fiber by volume (Vf)
[1]ETW is tested at 82°C (180°F) after 14 days soaked in 71°C (160°F) water
The mechanical data provided are average values from a limited dataset. For additional data please contact Toray Advanced Composites

Intermediate Modulus Carbon 145gsm FAW UD Tape Laminate 34% RC				
Property	**Condition**	**Test Method**	**Results**	
Tensile Strength 0°	RTD	ASTM D 3039	3100 MPa	450 ksi
Tensile Modulus 0°	RTD	ASTM D 3039	159 GPa	23 Msi
Tensile Strength 90°	RTD	ASTM D 3039	86 MPa	12.5 ksi
Tensile Modulus 90°	RTD	ASTM D 3039	10 GPa	1.5 Msi
Compressive Strength 0°	RTD	ASTM D 6641	1300 MPa	189 ksi

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Intermediate Modulus Carbon 145gsm FAW UD Tape Laminate 34% RC				
Property	**Condition**	**Test Method**	**Results**	
Compressive Modulus 0°	RTD	ASTM D 6641	138 GPa	20 ksi
Flexural Strength 90°	RTD	ASTM D 7264	162 MPa	23.5 ksi
Interlaminar Shear Strength (SBS) 0°/ 90°	RTD	ASTM D 2344	96.5 MPa	14 ksi
Open-Hole Tensile Strength	RTD	ASTM D 5766	655 MPa	95 ksi
Open-Hole Compressive Strength	RTD	ASTM D 6484	303 MPa	44 ksi
Compression After Impact Strength 30.5 J (270 in/lb) Impact Energy	RTD	ASTM D 7137	331 MPa	48 ksi
Fiber type IM7 59% fiber by volume (Vf)				

S2-Glass 204gsm FAW UD Tape Laminate 29% RC				
Property	**Condition**	**Test Method**	**Results**	
Tensile Strength 0°	RTD	ASTM D 3039	1520 MPa	220 ksi
Tensile Modulus 0°	RTD	ASTM D 3039	52 GPa	7.5 Msi
Poisson's Ratio	RTD	ASTM D 3039	0.29	
Compression Strength 0°	RTD	ASTM D 6641	1600 MPa	232 ksi
Compression Modulus 0°/90°	RTD	ASTM D 6641	53 GPa	7.7 Msi
In-Plane Shear Tension Strength ±45°	RTD	ASTM D 3518	77 MPa	11.2 ksi
In-Plane Shear Tension Modulus ±45°	RTD	ASTM D 3518	3.3 GPa	0.48 Msi
Flexural Strength 0°	RTD	ASTM D 790	1600 MPa	232 ksi
Flexural Modulus 0°	RTD	ASTM D 790	53 GPa	7.7 Msi
Short Beam Shear ILSS 0°	RTD	ASTM D 2344	86 MPa	12.5 ksi
56% fiber by volume (Vf)				

HEALTH & SAFETY

Health and safety information on handling and processing Toray composite materials is described in the Safety Data Sheet available from Toray Advanced Composites. To obtain this or any other information about Toray Cetex® PEEK thermoplastic composite materials, contact Toray Advanced Composites.

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