Toray Cetex® TC1225
LMPAEK™

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Toray Advanced Composites

PRODUCT DATA SHEET

DESCRIPTION

Toray Cetex® TC1225 is a high-end thermoplastic composite material, utilizing a semi-crystalline low-melt PAEK resin with excellent mechanical performance. The distinctive value of Toray Cetex® TC1225, over other composites with a PAEK family matrix, is its superior processability, and excellent VBO (Vaccuum Bag Only) performance, due to a low-melt viscosity and reduction in processing temperature of up to 60°C (140°F)*. Toray Cetex® TC1225 doesn't only yield a high-quality product used in ATL/AFP processes, it also speeds up cycle times enabling cost-efficient production in all available formats.

Additionally, Toray Cetex® TC1225 is an ideal composite to be overmolded with neat or short fiber reinforced PEEK resin, creating a very strong bond. Overmolding, integrating continuous fiber reinforced composites in an injection molding process, combines the strength of high-end composites with the design freedom and complexity of injection molding parts.

Toray Cetex® TC1225 is available as a UD tape, a fabric prepreg, and as reinforced thermoplastic laminates (RTLs) of varying thicknesses. 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.

*Standard PEEK processes at temperatures up to 400°C (752°F)

FEATURES

- **Resin rich surface for superior processability and suitability for wide range of thermoplastic product methods: Press Consolidation, Stamp Forming, ATL, AFP, Continuous Compression Molding, Out-of-Autoclave VBO, Autoclave, Welding, and Overmolding**
- **Excellent VBO performance**
- **Form freedom—suited for overmolding with neat or short fiber reinforced PEEK**
- **Relatively low processing temperature enables shorter cycle times and less energy consumption**
- **Excellent mechanical performance, also at elevated temperatures**
- **Excellent toughness—demonstrated by high compression after impact strengths and fracture toughness values**
- **Very low moisture absorption (high hot/wet property retention)**
- **Outstanding chemical and solvent resistance**
- **Indefinite shelf life at ambient temperature storage**
- **Excellent FST performance**
- **Recyclability**

PRODUCT TYPE

LMPAEK™ (Low-Melt PolyArylEtherKetone) Thermoplastic Resin System

TYPICAL APPLICATIONS

- Primary and secondary aircraft structures
- High-load aircraft interiors applications
- Access panels, rib stiffeners, brackets
- Radome
- Medical
- Oil and gas

TYPICAL NEAT RESIN PROPERTIES

Density (specific gravity)	1.30 g/cm³ (81.2 lb/ft³)
T_g (glass transition)	147°C (297°F)
T_m (melt)	305°C (581°F)
T_c (crystallinity)	263°C (505°F)
T_p (processing)	340–385°C (644–725°F)

SHELF LIFE

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

Contact us for more information:

North America/Asia/Pacific
e **explore@toraytac-usa.com**
t **+1 408 465 8500**

Europe/Middle East/Africa
e **explore@toraytac-europe.com**
t **+31 (0) 548 633 933**

Cetex®

PRODUCT DATA SHEET

PHYSICAL PROPERTIES—CARBON

Property	TC1225 T700GC Standard Modulus Carbon UD Tape	TC1225 T1100GC Intermediate Modulus Carbon UD Tape	5 Harness Satin (T300JB Carbon Woven Prepreg)
Fiber areal weight (FAW)	145 g/m² (4.28 oz/yd²)	145 g/m² (4.28 oz/yd²)	280 g/m² (8.29 oz/yd²)
Prepreg areal weight (PPAW)	221 g/m² (6.52 oz/yd²)	221 g/m² (6.52 oz/yd²)	479 g/m² (14.42 oz/yd²)
Resin content by weight (RC)	34%	34%	42%
Consolidated ply thickness (CPT)	0.14 mm (0.0054 in.)	0.135 mm (0.0053 in.)	0.31 mm (0.0122 in.)
Density	1.59 g/cm³ (99.3 lb/ft³)	1.59 g/cm³ (99.3 lb/ft³)	1.53 g/cm³ (95.51 lb/ft³)

These reinforcements are available as rolls of semi-preg or as RTLs. Lightning-strike protection layers can be incorporated into RTLs. A glass scrim can also be added to the surface of carbon fiber based laminates. This glass scrim is often used to protect against galvanic corrosion in assemblies where carbon fiber composites are in contact with metal components.

PHYSICAL PROPERTIES—GLASS (STRUCTURAL USE)

Property	US Style 7781 8 Harness Satin (EC6 Glass Woven Prepreg)	US Style 6781 8 Harness Satin (S2 C9 Glass Woven Prepreg)
Fiber areal weight (FAW)	296 g/m² (8.73 oz/yd²)	298 g/m² (8.79 oz/yd²)
Weight per ply (PAW)	448 g/m² (13.21 oz/yd²)	452 g/m² (13.33 oz/yd²)
Resin content by weight (RC)	34%	34%
Consolidated ply thickness (CPT)	0.24 mm (0.009 in.)	0.24 mm (0.009 in.)
Density	1.92 g/cm³ (119.8 lbs/ft³)	1.87 g/cm³ (116.7 lbs/ft³)

The reinforcements above are available as rolls of semi-preg or as RTLs. RTLs can consist of glass plies only or can incorporate UD carbon tapes or woven carbon tapes as required.

PHYSICAL PROPERTIES—GLASS SCRIM

Property	US Style 0120 4 Harness Satin (EC5 Glass Woven Prepreg)	US Style 1080 Plain Weave (EC5 Glass Woven Prepreg)
Fiber areal weight (FAW)	105 g/m² (3.10 oz/yd²)	48 g/m² (1.42 oz/yd²)
Weight per ply (PAW)	210 g/m² (6.19 oz/yd²)	120 g/m² (3.54 oz/yd²)
Resin content by weight (RC)	50%	60%
Consolidated ply thickness (CPT)	0.12 mm (0.005 in.)	0.08 mm (0.003 in.)
Density	1.71 g/cm³ (106.8 lbs/ft³)	1.61 g/cm³ (100.5 lbs/ft³)

The reinforcements above are available as rolls of semi-preg or can be added to the surface of RTLs of carbon UD tape or carbon woven fabric to act as a barrier to prevent galvanic corrosion.

PRODUCT DATA SHEET

MECHANICAL PROPERTIES

T700GC Standard Modulus Carbon 145gsm UD Tape 34% RC				
Property	**Condition**	**Test Method**	**Results**	
Tensile Strength 0°	RTA	ASTM D 3039	2410 MPa	350 ksi
Tensile Modulus 0°	RTA	ASTM D 3039	135 GPa	19.5 Msi
Tensile Strength 90°	RTA	ASTM D 3039	86 MPa	12.5 ksi
Tensile Modulus 90°	RTA	ASTM D 3039	10 GPa	1.4 Msi
Compression Strength 0°	RTA	ASTM D 6641	1300 MPa	189 ksi
Compression Modulus 0°	RTA	ASTM D 6641	124 GPa	18 Msi
In-Plane Shear Strength 5% Strain	RTA	ASTM D 3518	65.5 MPa	9.5 ksi
In-Plane Shear Strength 0.2% Offset	RTA	ASTM D 3518	42.0 MPa	6.1 ksi
In-Plane Shear Modulus	RTA	ASTM D 3518	4.3 GPa	0.62 Msi
Flexural Strength 90°	RTA	ASTM D 790	152 MPa	22 ksi
Interlaminar Shear Strength (SBS) 0°/90°	RTA	ASTM D 2344	96.5 MPa	14 ksi
Open-Hole Tensile Strength	RTA	ASTM D 5766	448 MPa	65 ksi
Open-Hole Tensile Strength	CTA	ASTM D 5766	448 MPa	65 ksi
Open-Hole Compression Strength	RTA	ASTM D 6484	310 MPa	45 ksi
Open-Hole Compression Strength	ETA	ASTM D 6484	262 MPa	38 ksi
Compression After Impact Strength 30.5 J (270 in/lb) Impact Energy	RTA	ASTM D 7137	310 MPa	45 ksi
Mode I Interlaminar Fracture Toughness (G_{IC} Strain Energy Release Rate)	RTA	ASTM D 5528	2.1 kJ/m²	12.0 in-lb/in²
Mode II Interlaminar Fracture Toughness (G_{IIC} Strain Energy Release Rate)	RTA	ASTM D 7905	2.6 kJ/m²	15.0 in-lb/in²

Room Temperature Ambient (RTA)
Cold Temperature Ambient (CTA) is -54°C (-65°F)
Elevated Temperature Ambient (ETA) is 121°C (250°F)

PRODUCT DATA SHEET

T1100GC Intermediate Modulus Carbon 145gsm FAW UD Tape Laminate 34% RC				
Property	**Condition**	**Test Method**	**Results**	
Tensile Strength 0°	RTA	ASTM D 3039	3613 MPa	524 ksi
Tensile Modulus 0°	RTA	ASTM D 3039	173 GPa	25.1 Msi
Tensile Strength 90°	RTA	ASTM D3039	90 MPa	13.0 ksi
Tensile Modulus 90°	RTA	ASTM D 3039	9.0 GPa	1.3 Msi
Compressive Strength 0°	RTA	ASTM D 6641	1595 MPa	231 ksi
Compressive Modulus 0°	RTA	ASTM D 6641	162 GPa	23.4 Msi
In-Plane Shear Strength 5% Strain	RTA	ASTM D 3518	69.0 MPa	10.0 ksi
In-Plane Shear Strength 0.2% Offset	RTA	ASTM D 3518	40.5 MPa	5.9 ksi
In-Plane Shear Modulus	RTA	ASTM D 3518	4.03 GPa	0.585 Msi
Interlaminar Shear Strength (SBS)	RTA	ASTM D 2344	106 MPa	15.4 ksi
Open-Hole Tensile Strength	RTA	ASTM D 5766	641 MPa	93.3 ksi
Open-Hole Compressive Strength	RTA	ASTM D 6484	303 MPa	44 ksi
Unnotched Tensile Strength (25/50/25)	RTA	ASTM D 3039	1230 MPa	178 ksi
Unnotched Tensile Modulus (25/50/25)	RTA	ASTM D 3039	60.7 GPa	8.8 Msi
Unnotched Compressive Strength (25/50/25)	RTA	ASTM D 6641	633 MPa	92 ksi
Unnotched Compressive Modulus (25/50/25)	RTA	ASTM D 6641	60.6 GPa	8.8 Msi
Compression After Impact Strength 30.5 J (270 in-lb) Impact Energy	RTA	ASTM D 7137	312 MPa	45.3 ksi
Mode I Interlaminar Fracture Toughness G_{IC}	RTA	ASTM D 5528	2.0 kJ/m²	11.5 in-lb/in²
Mode II Interlaminar Fracture Toughness G_{IIC}	RTA	ASTM D 7905	2.9 kJ/m²	16.5 in-lb/in²
Laminates consolidated using static press at 10 bar (145 psi) and 365°C (689°F) with resin rich prepreg configuration				

PRODUCT DATA SHEET

High Strength T300JB 3K Carbon 280gsm 5HS Woven Fabric Reinforced Laminate 42% RC				
Property	**Condition**	**Methods**	**Results**	
Tensile Strength 0°	RTA	ASTM D 3039	765 MPa	111 ksi
Tensile Modulus 0°	RTA	ASTM D 3039	59 GPa	8.6 Msi
Tensile Strength 0°	ETA	ASTM D 3039	820 MPa	119 ksi
Tensile Modulus 0°	ETA	ASTM D 3039	60 GPa	8.7 Msi
Tensile Strength 90°	RTA	ASTM D 3039	758 MPa	110 ksi
Tensile Modulus 90°	RTA	ASTM D 3039	59 GPa	8.6 Msi
Tensile Strength 90°	ETA	ASTM D 3039	765 MPa	111 ksi
Tensile Modulus 90°	ETA	ASTM D 3039	59 GPa	8.6 Msi
Compression Strength 0°	RTA	ASTM D 6641	636 MPa	92.2 ksi
Compression Modulus 0°	RTA	ASTM D 6641	55 GPa	8.0 Msi
Compression Strength 0°	ETA	ASTM D 6641	490 MPa	70.9 ksi
Compression Modulus 0°	ETA	ASTM D 6641	56 GPa	8.2 Msi
Compression Strength 90°	RTA	ASTM D 6641	607 MPa	88.0 ksi
Compression Modulus 90°	RTA	ASTM D 6641	55 GPa	8.0 Msi
Compression Strength 90°	ETA	ASTM D 6641	455 MPa	66.0 ksi
Compression Modulus 90°	ETA	ASTM D 6641	56 GPa	8.2 Msi
In-Plane Shear Strength 5% Strain	RTA	ASTM D 3518	69 MPa	9.95 ksi
In-Plane Shear Strength 0.2% Offset	RTA	ASTM D 3518	39 MPa	5.67 ksi
In-Plane Shear Modulus	RTA	ASTM D 3518	3.8 GPa	0.553 Msi
In-Plane Shear Strength 5% Strain	ETA	ASTM D 3518	41 MPa	5.97 ksi
In-Plane Shear Strength 0.2% Offset	ETA	ASTM D 3518	23 MPa	3.40 ksi
In-Plane Shear Modulus	ETA	ASTM D 3518	2.6 GPa	0.371 Msi
Open-Hole Tensile Strength (25/50/25)	RTA	ASTM D 5766	318 MPa	46.2 ksi
Open-Hole Compressive Strength (25/50/25)	RTA	ASTM D 6484	294 MPa	42.7 ksi
Unnotched Tensile Strength (25/5025)	RTA	ASTM D 3039	545 MPa	79 ksi
Unnotched Tensile Modulus (25/5025)	RTA	ASTM D 3039	41 GPa	6.0 Msi
Unnotched Compressive Strength (25/5025)	RTA	ASTM D 6641	465 MPa	67.5 ksi
Unnotched Compressive Modulus (25/5025)	RTA	ASTM D 6641	39 GPa	5.7 Msi
Compression After Impact Strength	RTA	ASTM D 7137	310 MPa	45 ksi
Interlaminar Tension Strength	RTA	ASTM D 6415	61 GPa	8.8 ksi

Material qualification data generated using the NCAMP process. Each reported value represents an average of 18 data points from 3 material batches.
ETA is 250°F

PRODUCT DATA SHEET

US Style 7781 EC6 Glass 296gsm 8HS Woven Fabric Reinforced Laminate 34% RC				
Property	**Condition**	**Methods**	**Results**	
Tensile Strength 0°	RTD	ASTM D 3039	480 MPa	70 ksi
Tensile Modulus 0°	RTD	ASTM D 3039	23.7 GPa	3.4 Msi
Tensile Strength 90°	RTD	ASTM D 3039	424 MPa	61 ksi
Tensile Modulus 90°	RTD	ASTM D 3039	22.0 GPa	3.2 Msi
Compression Strength 0°	RTD	ASTM D 6641	365 MPa	53 ksi
Compression Modulus 0°	RTD	ASTM D 6641	26.7 GPa	3.9 Msi
Compression Strength 90°	RTD	ASTM D 6641	332 MPa	48 ksi
Compression Modulus 90°	RTD	ASTM D 6641	25.7 GPa	3.7 Msi
In Plane Shear Strength	RTD	ASTM D 3518	47 MPa	7 ksi
In Plane Shear Modulus	RTD	ASTM D 3518	2.70 GPa	0.39 Msi
Flexural Strength 0°	RTD	ISO 178	544 MPa	79 ksi
Flexural Modulus 0°	RTD	ISO 178	24 GPa	3.4 Msi
Flexural Strength 90°	RTD	ISO 178	454 MPa	66 ksi
Flexural Modulus 90°	RTD	ISO 178	20.0 GPa	2.9 Msi
Tensile Strength 0°	ETW	ASTM D 3039	333 MPa	48 ksi
Tensile Modulus 0°	ETW	ASTM D 3039	22.0 GPa	3 Msi
Tensile Strength 90°	ETW	ASTM D 3039	289 MPa	42 ksi
Tensile Modulus 90°	ETW	ASTM D 3039	20.3 GPa	3 Msi
Compression Strength 0°	ETW	ASTM D 6641	197 MPa	29 ksi
Compression Modulus 0°	ETW	ASTM D 6641	25.0 GPa	3.6 Msi
Compression Strength 90°	ETW	ASTM D 6641	171 MPa	25 ksi
Compression Modulus 90°	ETW	ASTM D 6641	23.0 GPa	3.3 Msi
In Plane Shear Strength	ETW	ASTM D 3518	26 MPa	4 ksi
In Plane Shear Modulus	ETW	ASTM D 3518	1.43 GPa	0.21 Msi

Room Temperature Dry (RTD) is 23°C (73.4°F)
Elevated Temperature Wet (ETW) is tested at 80°C/dry after 1000 hours of conditioning at 70°C/85% RH 50% fiber by volume (Vf)
For additional data please contact Toray Advanced Composites.

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PRODUCT DATA SHEET

US Style 7781 EC6 Glass 296gsm FAW 8HS Woven Fabric Reinforced Laminate 34% RC				
Property	**Condition**	**Methods**	**Results**	
Tensile Strength 0°	HD	ASTM D3039	431 MPa	63 ksi
Tensile Modulus 0°	HD	ASTM D3039	23.0 GPa	3.3 Msi
Tensile Strength 90°	HD	ASTM D3039	338 MPa	49 ksi
Tensile Modulus 90°	HD	ASTM D3039	20.0 GPa	2.9 Msi
Compression Strength 0°	HD	ASTM D6641	312 MPa	45 ksi
Compression Modulus 0°	HD	ASTM D6641	26.0 GPa	3.8 Msi
Compression Strength 90°	HD	ASTM D6641	254 MPa	37 ksi
Compression Modulus 90°	HD	ASTM D6641	24.0 GPa	3.5 Msi
In Plane Shear Strength	HD	ASTM D3518	40 MPa	6 ksi
In Plane Shear Modulus	HD	ASTM D3518	2.33 GPa	0.34 Msi

Hot Dry (HD) is tested at 80°C (194°F)/dry
50% fiber by volume (Vf)
For additional data please contact Toray Advanced Composites.

PRODUCT DATA SHEET

US Style 6781 S2 Glass 298gsm 8HS Woven Fabric Reinforced Laminate 34% RC				
Property	**Condition**	**Methods**	**Results**	
Tensile Strength 0°	RTD	ASTM D 3039	660 MPa	96 ksi
Tensile Modulus 0°	RTD	ASTM D 3039	25.0 GPa	3.6 Msi
Tensile Strength 90°	RTD	ASTM D 3039	597 MPa	87 ksi
Tensile Modulus 90°	RTD	ASTM D 3039	23.5 GPa	3.4 Msi
Compression Strength 0°	RTD	ASTM D 6641	256.5 MPa	37 ksi
Compression Modulus 0°	RTD	ASTM D 6641	29.5 GPa	4.3 Msi
Compression Strength 90°	RTD	ASTM D 6641	257 MPa	37 ksi
Compression Modulus 90°	RTD	ASTM D 6641	27.5 GPa	4.0 Msi
In Plane Shear Strength	RTD	ASTM D 3518	37 MPa	5 ksi
In Plane Shear Modulus	RTD	ASTM D 3518	1.85 GPa	0.27 Msi
Flexural Strength 0°	RTD	ISO 178	459 MPa	67 ksi
Flexural Modulus 0°	RTD	ISO 178	27 GPa	3.8 Msi
Flexural Strength 90°	RTD	ISO 178	399 MPa	58 ksi
Flexural Modulus 90°	RTD	ISO 178	23 GPa	3.3 Msi
Tensile Strength 0°	ETW	ASTM D 3039	519 MPa	75 ksi
Tensile Modulus 0°	ETW	ASTM D 3039	25.0 GPa	3.6 Msi
Tensile Strength 90°	ETW	ASTM D 3039	463 MPa	67 ksi
Tensile Modulus 90°	ETW	ASTM D 3039	23.5 GPa	3.4 Msi
Compression Strength 0°	ETW	ASTM D 6641	171 MPa	25 ksi
Compression Modulus 0°	ETW	ASTM D 6641	28.0 GPa	4.1 Msi
Compression Strength 90°	ETW	ASTM D 6641	165 MPa	24 ksi
Compression Modulus 90°	ETW	ASTM D6641	26.0 GPa	3.8 Msi
In Plane Shear Strength	ETW	ASTM D 3518	24 MPa	3 ksi
In Plane Shear Modulus	ETW	ASTM D 3518	1.10 GPa	0.16 Msi

Room Temperature Dry (RTD) is 23°C (73.4°F)
Elevated Temperature Wet (ETW) is tested at 80°C/dry after 1000 hours of conditioning at 70°C/85% RH 50% fiber by volume (Vf)
For additional data please contact Toray Advanced Composites.

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PRODUCT DATA SHEET

US Style 6781 S2 Glass 298gsm 8HS Woven Fabric Reinforced Laminate 34% RC				
Property	**Condition**	**Methods**	**Results**	
Tensile Strength 0°	HD	ASTM D 3039	623 MPa	90 ksi
Tensile Modulus 0°	HD	ASTM D 3039	25.0 GPa	3.6 Msi
Tensile Strength 90°	HD	ASTM D 3039	544 MPa	79 ksi
Tensile Modulus 90°	HD	ASTM D 3039	24.0 GPa	3.5 Msi
Compression Strength 0°	HD	ASTM D 6641	233 MPa	34 ksi
Compression Modulus 0°	HD	ASTM D 6641	29.0 GPa	4.2 Msi
Compression Strength 90°	HD	ASTM D 6641	219 MPa	32 ksi
Compression Modulus 90°	HD	ASTM D 6641	27.0 GPa	3.9 Msi
In Plane Shear Strength	HD	ASTM D 3518	32 MPa	5 ksi
In Plane Shear Modulus	HD	ASTM D 3518	1.60 GPa	0.23 Msi

Hot Dry (HD) is tested at 80°C (194°F)/dry 50% fiber by volume (Vf)
For additional data please contact Toray Advanced Composites.

TORAY Toray Advanced Composites

18255 Sutter Blvd.
Morgan Hill, CA 95037, USA
t +1 408 465 8500

G. van der Muelenweg 2
7443 RE Nijverdal, The Netherlands
t +31 (0) 548 633 933

Cetex®
www.toraytac.com
explore@toraytac-usa.com (North America/Asia/Pacific)
explore@toraytac-europe.com (Europe/Middle East/Africa)