

## PRODUCT DATA SHEET

### DESCRIPTION

Toray Cetex® TC1100 is a high-end but cost-effective thermoplastic composite material, utilizing a semi-crystalline PPS polymer for excellent mechanical properties and an outstanding chemical and solvent resistance.

With over 7 million parts in flight and qualified for structural application at Airbus, Boeing, and many other airframe OEMs, Toray Cetex® TC1100 offers a great balance between cost and performance, both mechanical and chemical. The material is inherently flame resistant (< 35/35 OSU) with low smoke emission.

Besides application in aerospace, Toray Cetex® TC1100 is often the material of choice for demanding industrial applications.

Toray Cetex® TC1100 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.

### FEATURES

- ▶ **Qualified and certified to aerospace OEM specifications**
- ▶ **Outstanding performance-to-cost ratio**
- ▶ **Service temperature can exceed  $T_g$  depending on part design**
- ▶ **Lightning strike material as well as galvanic corrosion protection can be incorporated on laminates**
- ▶ **Inherently flame retardant**
- ▶ **Outstanding chemical and solvent resistance**
- ▶ **Indefinite shelf life at ambient temperature storage**

### PRODUCT TYPE

PPS (PolyPhenyleneSulfide) Thermoplastic Resin System

### TYPICAL APPLICATIONS

- ▶ Primary and secondary aircraft structures: wing leading edges, engine pylon structures, clips and cleats for fuselage structure
- ▶ Aircraft interiors: acoustic structures, structural components of seats, galleys, stowage boxes
- ▶ High-end industrial applications where corrosive environments, dimensional stability, or vibration dampening play a role

### TYPICAL NEAT RESIN PROPERTIES

Density (specific gravity)	1.35 g/cm <sup>3</sup> (84.3 lb/ft <sup>3</sup> )
$T_g$ (glass transition)	90°C (194°F)
$T_m$ (melt)	280°C (536°F)
$T_p$ (processing)	300–330°C (570–625°F)

### MAIN QUALIFICATIONS

- ▶ ABS 5045
- ▶ ABS 5222
- ▶ MEP 15-052
- ▶ NTA 62901 (Type II)

### SHELF LIFE

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



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### PHYSICAL PROPERTIES

Property	5 Harness Satin (T300JB Carbon Woven Prepreg)	8 Harness Satin (EC9 Glass Woven Prepreg)	Standard Modulus Carbon UD tape	Plain Weave (T300JB Carbon Woven Prepreg)
Fiber areal weight (FAW)	280 g/m <sup>2</sup> (8.17 oz/yd <sup>2</sup> )	300 g/m <sup>2</sup> (8.85 oz/yd <sup>2</sup> )	221 g/m <sup>2</sup> (5.72 oz/yd <sup>2</sup> )	200 g/m <sup>2</sup> (5.90 oz/yd <sup>2</sup> )
Weight per ply (PAW)	496 g/m <sup>2</sup> (14.63 oz/yd <sup>2</sup> )	460 g/m <sup>2</sup> (13.57 oz/yd <sup>2</sup> )	335 g/m <sup>2</sup> (9.88 oz/yd <sup>2</sup> )	355 g/m <sup>2</sup> (10.47 oz/yd <sup>2</sup> )
Resin content by weight (RC)	43%	34%	34%	43%
Consolidated ply thickness (CPT)	0.31 mm (0.0122")	0.24 mm (0.0094")	0.21 mm (0.0083")	0.23 mm (0.0091")
Density	1.55 g/cm <sup>3</sup> (96.76 lb/ft <sup>3</sup> )	1.95 g/cm <sup>3</sup> (121.73 lb/ft <sup>3</sup> )	1.59 g/cm <sup>3</sup> (99.26 lb/ft <sup>3</sup> )	1.55 g/cm <sup>3</sup> (96.76 lb/ft <sup>3</sup> )
Width	1270 mm (50")	1270 mm (50")	305 mm (12")*	1270 mm (50")

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

Standard Modulus T300JB 3K Carbon 280gsm FAW 5HS Woven Fabric Reinforced Laminate 43% RC				
Property	Condition	Test Method	Results	
Tensile Strength 0°	RTD	EN 2597 B	752 MPa	109 ksi
Tensile Modulus 0°	RTD	EN 2597 B	58.0 GPa	8.4 Msi
Tensile Strength 90°	RTD	EN 2597 B	785 MPa	114 ksi
Tensile Modulus 90°	RTD	EN 2597 B	56.0 GPa	8.1 Msi
Compression Strength 0°	RTD	EN 2850 B	619 MPa	90 ksi
Compression Modulus 0°	RTD	EN 2850 B	53.0 GPa	7.7 Msi
Compression Strength 90°	RTD	EN 2850 B	609 MPa	88 ksi
Compression Modulus 90°	RTD	EN 2850 B	53.0 GPa	7.7 Msi
In-Plane Shear Strength ±45°	RTD	AITM 1-0002	130 MPa	19 ksi
In-Plane Shear Modulus ±45°	RTD	AITM 1-0002	3.9 GPa	0.6 Msi
Flexural Strength 90°	RTD	EN 2562 A	842 MPa	122 ksi
Flexural Modulus 90°	RTD	EN 2562 A	45.0 GPa	6.5 Msi
Compression After Impact Strength	RTD	AITM 1-0010, issue 3	229 MPa	33 ksi

50% fiber by volume (V<sub>f</sub>)

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Standard Modulus T300JB 3K Carbon 280gsm FAW 5HS Woven Fabric Reinforced Laminate 43% RC				
Property	Condition	Test Method	Results	
Tensile Strength 0°	ETW*	EN 2597 B	736 MPa	107 ksi
Tensile Modulus 0°	ETW*	EN 2597 B	56.0 GPa	8.1 Msi
Tensile Strength 90°	ETW*	EN 2597 B	818 MPa	119 ksi
Tensile Modulus 90°	ETW*	EN 2597 B	56.0 GPa	8.1 Msi
Compression Strength 0°	ETW*	EN 2850 B	522 MPa	76 ksi
Compression Modulus 0°	ETW*	EN 2850 B	52.0 GPa	7.5 Msi
Compression Strength 90°	ETW*	EN 2850 B	481 MPa	70 ksi
Compression Modulus 90°	ETW*	EN 2850 B	52.0 GPa	7.5 Msi
In-Plane Shear Strength ±45°	ETW*	AITM 1-0002	112 MPa	16 ksi
In-Plane Shear Modulus ±45°	ETW*	AITM 1-0002	2.7 GPa	0.4 Msi
Flexural Strength 90°	ETW*	EN 2562 A	743 MPa	108 ksi
Flexural Modulus 90°	ETW*	EN 2562 A	44.0 GPa	6.4 Msi
Compression After Impact Strength	ETW*	AITM 1-0010, issue 3	220 MPa	32 ksi

50% fiber by volume (Vf)  
 \*ETW is tested at 80°C (76°F)/dry after 1000 hours of conditioning at 70°C (158°F)/85% RH

Standard Modulus Carbon 221gsm FAW UD Tape Laminate 34% RC				
Property	Condition	Test Method	Results	
Tensile Strength 0°	RTD	ASTM D 3039	2020 MPa	294 ksi
Tensile Modulus 0°	RTD	ASTM D 3039	134 GPa	19.5 Msi
Tensile Strength 90°	RTD	ASTM D 3039	39 MPa	5.7 ksi
Tensile Modulus 90°	RTD	ASTM D 3039	10 GPa	1.4 Msi
Compressive Strength 0°	RTD	ASTM D 6641	1100 MPa	160 ksi
Compressive Modulus 0°	RTD	ASTM D 6641	117 GPa	17 Msi
In-Plane Shear Strength ±45°	RTD	ASTM D 3518	82 MPa	11.9 ksi
In-Plane Shear Modulus ±45°	RTD	ASTM D 3518	3.5 GPa	0.5 Msi
Flexural Strength 90°	RTD	ASTM D 7264	68 MPa	9.9 ksi
Open-Hole Compressive Strength	RTD	ASTM D 6484	267 MPa	38.7 ksi
Compression After Impact Strength 30.5 J (270 in/lb) Impact Energy	RTD	ASTM D 7137	216 MPa	31.4 ksi

Fiber type AS4A  
 59% fiber by volume (Vf)

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### MECHANICAL PROPERTIES

EC9 Glass 300gsm FAW 8HS Woven Fabric Reinforced Laminate 34% RC				
Property	Condition	Test Method	Results	
Tensile Strength 0°	RTD	EN 2747-III	494 MPa	72 ksi
Tensile Modulus 0°	RTD	EN 2747-III	21.2 GPa	3.1 Msi
Tensile Strength 90°	RTD	EN 2747-III	369 MPa	53 ksi
Tensile Modulus 90°	RTD	EN 2747-III	20.0 GPa	2.9 Msi
Compression Strength 0°	RTD	ASTM D 6641	470 MPa	68 ksi
Compression Modulus 0°	RTD	ASTM D 6641	26.2 GPa	3.8 ksi
Compression Strength 90°	RTD	ASTM D 6641	316 MPa	46 ksi
Compression Modulus 90°	RTD	ASTM D 6641	24.3 GPa	3.5 Msi
Flexural Strength 0°	RTD	ISO 178	659 MPa	96 ksi
Flexural Modulus 90°	RTD	ISO 178	23.1 GPa	3.4 Msi
Flexural Strength 0°	RTD	ISO 178	467 MPa	68 ksi
Flexural Modulus 90°	RTD	ISO 178	19.3 GPa	2.8 Msi
In-Plane Shear Strength ±45°	RTD	AITM 1-0002	98 MPa	14 ksi
In-Plane Shear Modulus ±45°	RTD	AITM 1-0002	4.1 GPa	0.6 Msi
Open-Hole Tensile Strength 0°	RTD	AITM 1-0007 iss. 2	180 MPa	26 ksi
Open-Hole Compressive Strength 0°	RTD	AITM 1-0007 iss. 2	192 MPa	28 ksi
Bolt Bearing	RTD	ITM 1-0009	596 MPa	86 ksi
Compression After Impact Strength	RTD	AITM 1-0010 at 1 mm indent	150 MPa	22 ksi
Tensile Strength 0°	ETW*	EN 2747-III	349 MPa	51 ksi
Tensile Modulus 0°	ETW*	EN 2747-III	20.8 GPa	3.0 Msi
Tensile Strength 90°	ETW*	EN 2747-III	294 MPa	43 ksi
Tensile Modulus 90°	ETW*	EN 2747-III	19.1 GPa	2.8 Msi
Compression Strength 0°	ETW*	ASTM D 6641	278 MPa	40 ksi
Compression Modulus 0°	ETW*	ASTM D 6641	23.9 GPa	3.5 Msi
Compression Strength 90°	ETW*	ASTM D 6641	204 MPa	30 ksi
Compression Modulus 90°	ETW*	ASTM D 6641	22.2 GPa	3.2 Msi
Flexural Strength 0°	ETW*	ISO 178	433 MPa	63 ksi
Flexural Modulus 90°	ETW*	ISO 178	22.3 GPa	3.2 Msi
Flexural Strength 0°	ETW*	ISO 178	309 MPa	45 ksi
Flexural Modulus 90°	ETW*	ISO 178	18.7 GPa	2.7 Msi
In-Plane Shear Strength ±45°	ETW*	AITM 1-0002	74 MPa	11 ksi
In-Plane Shear Modulus ±45°	ETW*	AITM 1-0002	1.9 GPa	0.3 Msi
Open-Hole Tensile Strength 0°	ETW*	AITM 1-0007 iss. 2	126 MPa	18 ksi
Open-Hole Compressive Strength 0°	ETW*	AITM 1-0007 iss. 2	127 MPa	18 ksi

50% fiber by volume (Vf)  
Fabric style 7781

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Standard Modulus T300JB 3K Carbon 200gsm FAW PW Woven Fabric Reinforced Laminate 43% RC				
Property	Condition	Test Method	Results	
Tensile Strength 0°	RTD	EN 2597 B	753 MPa	109 ksi
Tensile Modulus 0°	RTD	EN 2597 B	55.9 GPa	8.1 Msi
Tensile Strength 90°	RTD	EN 2597 B	716 MPa	104 ksi
Tensile Modulus 90°	RTD	EN 2597 B	54.4 GPa	7.9 Msi
Compression Strength 0°	RTD	EN 2850	571 MPa	83 ksi
Compression Modulus 0°	RTD	EN 2850	51.9 GPa	7.5 Msi
Compression Strength 90°	RTD	EN 2850	586 MPa	85 ksi
Compression Modulus 90°	RTD	EN 2850	51.6 GPa	7.5 Msi
In-Plane Shear Strength ±45°	RTD	AITM 1-0002	124 MPa	18 ksi
In-Plane Shear Modulus ±45°	RTD	AITM 1-0002	3.9 GPa	0.6 Msi
Flexural Strength 0°	RTD	EN 2562 A	897 MPa	130 ksi
Flexural Modulus 0°	RTD	EN 2562 A	49.0 GPa	7.1 Msi
Flexural Strength 90°	RTD	EN 2562 A	839 MPa	122 ksi
Flexural Modulus 90°	RTD	EN 2562 A	49.3 GPa	7.2 Msi
Open-Hole Tensile Notched Strength	RTD	EN 6035	264 MPa	38 ksi
Open-Hole Tensile Unnotched Strength	RTD	EN 6035	527 MPa	76 ksi
Open-Hole Compression Notched Strength	RTD	EN 6036	262 MPa	38 ksi
Open-Hole Compression Unnotched Strength	RTD	EN 6036	428 MPa	62 ksi
Bearing Strength	RTD	EN 6037	824 MPa	120 ksi
Bearing Strength Modulus	RTD	EN 6037	406 GPa	58.9 Msi
Tensile Strength 0°	CD**	EN 2597 B	755 MPa	109 ksi
Tensile Modulus 0°	CD**	EN 2597 B	54.0 GPa	7.8 Msi
Tensile Strength 90°	CD**	EN 2597 B	737 MPa	107 ksi
Tensile Modulus 90°	CD**	EN 2597 B	53.3 GPa	7.7 Msi
Open-Hole Tensile Notched Strength	CD**	EN 6035	288 MPa	42 ksi
Compression Strength 0°	ETW*	EN 2850	528 MPa	77 ksi
Compression Modulus 0°	ETW*	EN 2850	52.1 GPa	7.6 Msi
Compression Strength 90°	ETW*	EN 2850	530 MPa	77 ksi
Compression Modulus 90°	ETW*	EN 2850	52.9 GPa	7.7 Msi
Compression After Impact Strength	RTD	AITM 1-0010, issue 3	265 MPa	38 ksi
Flexural Strength 0°	ETW*	EN 2562 A	821 MPa	119 ksi
Flexural Modulus 0°	ETW*	EN 2562 A	49.5 GPa	7.2 Msi
Flexural Strength 90°	ETW*	EN 2562 A	821 MPa	119 ksi
Flexural Modulus 90°	ETW*	EN 2562 A	48.8 GPa	7.1 Msi

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Standard Modulus T300JB 3K Carbon 200gsm FAW PW Woven Fabric Reinforced Laminate 43% RC				
Property	Condition	Test Method	Results	
In-Plane Shear Strength ±45°	ETW*	AITM 1-0002	110 MPa	16 ksi
In-Plane Shear Modulus ±45°	ETW*	AITM 1-0002	2.7 GPa	0.4 Msi
Open-Hole Compression Notched Strength	ETW*	EN 6036	215 MPa	31 ksi
Bearing Strength	ETW*	EN 6037	805 MPa	117 ksi
Bearing Strength Modulus	ETW*	EN 6037	362 GPa	52.5 Msi

50% fiber by volume (Vf)  
 \*ETW is tested at 80°C (176°F)/dry after 1000 hours of conditioning at 70°C (158°F)/85% RH  
 \*\*CD is tested at -55°C (-67°F)/dry

Intermediate Modulus Carbon 146gsm FAW UD Tape Laminate 34% RC				
Property	Condition	Test Method	Results	
Tensile Strength 0°	RTD	ASTM D 3039	2760 MPa	400 ksi
Tensile Modulus 0°	RTD	ASTM D 3039	152 GPa	22.1 Msi
Tensile Strength 90°	RTD	ASTM D 3039	39 MPa	5.7 ksi
Tensile Modulus 90°	RTD	ASTM D 3039	10 GPa	1.4 Msi
Compressive Strength 0°	RTD	ASTM D 6641	1280 MPa	186 ksi
Compressive Modulus 0°	RTD	ASTM D 6641	124 GPa	18 Msi
Flexural Strength 90°	RTD	ASTM D 7264	65 MPa	9.5 ksi

Fiber type IM7  
 59% fiber by volume (Vf)

## HANDLING 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® PPS thermoplastic composite materials, contact Toray Advanced Composites.

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