TR1187 TCR Resin System

Technical Data Sheet

TR1187 is a high Tg epoxy resin designed specifically for dry high-temperature applications. It exhibits a long shelf life and room temperature stability for up to three months for easy handling.

Available Prepreg Product Formats
- Tow

Typical Applications
- High temperature
- Rotors

Shelf Life
- 3 months at 24°C (75°F)

Benefits/ Features
- Simple 177°C (350°F) cure cycle processing.
- Develops a cured composite E' DMA Tg value of >45°C (80°F) higher than the 177°C (350°F) required cure temperature.
- Develops a cured composite Tan δ DMA Tg value of >55°C (100°F) higher than the required 177°C (350°F) cure temperature.
- 3 month shelf life at 24°C (75°F)

Cure Conditions

Curing cycle for composite parts <0.25 inches in thickness

- Ramp ≤ 0.77°C/min to 177°C (350°F)
- Hold for 4 hours at 177°C (350°F)
- Ramp ≤ 2.5°C/min to ≤ 66°C (150°F)

Thick composite parts (>0.25 inches or 6.35 mm) will require a modified cure cycle. Please contact TCR Composites for more information.

Cured Neat Resin Physical Properties*

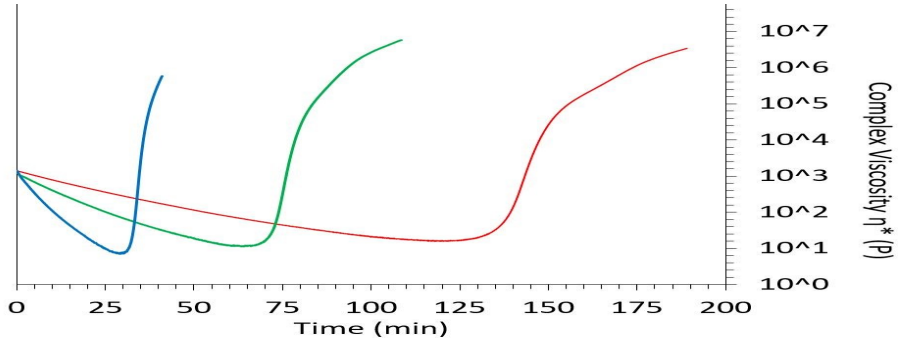
Properties	Metric	English	Test Method
Density	1.27 g/cc	0.0459 lbs/in^3	ASTM D 792
Tensile Strength	45.6 MPa	6.62 kpsi	ASTM D 638
Tensile Modulus	4.62 GPa	670 kpsi	ASTM D 638
Strain (% Elongation)	1.11%		ASTM D 638
DMA – Dry Glass Transition			
Glass Transition – E" Peak	225°C	437°F	ASTM E 1640
Glass Transition – E' Onset	213°C	415°F	ASTM E 1640
Glass Transition – Tan δ Peak	240°C	464°F	ASTM E 1640
DMA – Wet Glass Transition**			
Glass Transition – E" Peak	128°C	262°F	ASTM E 1640
Glass Transition – E' Onset	125°C	257°F	ASTM E 1640
Glass Transition – Tan δ Peak	155°C	311°F	ASTM E 1640
Water Absorption**	5.0%		ASTM D 570

*Neat Resin Cure cycle: 4 hours at 177°C

**DMA wet glass transition and water absorption measured after 24-hour water boil

Resin Cure Viscosity

Parallel-plate rheometer



0.56°C (1°F)/min—Min η*: 15.82 P, 103°C (217°F)

1.11°C (2°F)/min—Min η*: 11.20 P, 110°C (230°F)

2.78°C (5°F)/min—Min η*: 6.99 P, 120°C (248°F)

(η*) Time to Viscosity Minimum: {(Min η* Temperature (°C/°F) – (38°C/100°F)} ÷ {(°C/°F)/min}

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Composite Properties

Reinforcement: Intermediate modulus, 12K tow carbon fiber: T1100SC-12K-50C, 35% RC.
Cure cycle: 4 hours at 177°C (350°F) via vacuum bag oven cure, tests conducted at 22°C (72°F)

Properties	Metric	English	Test Method
0° Tensile Strength	2.28 GPa	331 kpsi	ASTM D3039
0° Tensile Modulus	158 GPa	23 Mpsi	ASTM D3039
0° Tensile Percent Strain	1.45 %		ASTM D3039
90° Tensile Strength	17.2 MPa	2.5 kpsi	ASTM D3039
0° Compressive Strength	1.0 GPa	146 kpsi	ASTM D6641
90° Compressive Strength	136 MPa	19.8 kpsi	ASTM D6641
Short Beam Strength	92 MPa	13.4 kpsi	ASTM D2344
Flexural Strength	2.46 GPa	357 kpsi	ASTM D790
Flexural Modulus	179 GPa	26 Mpsi	ASTM D790

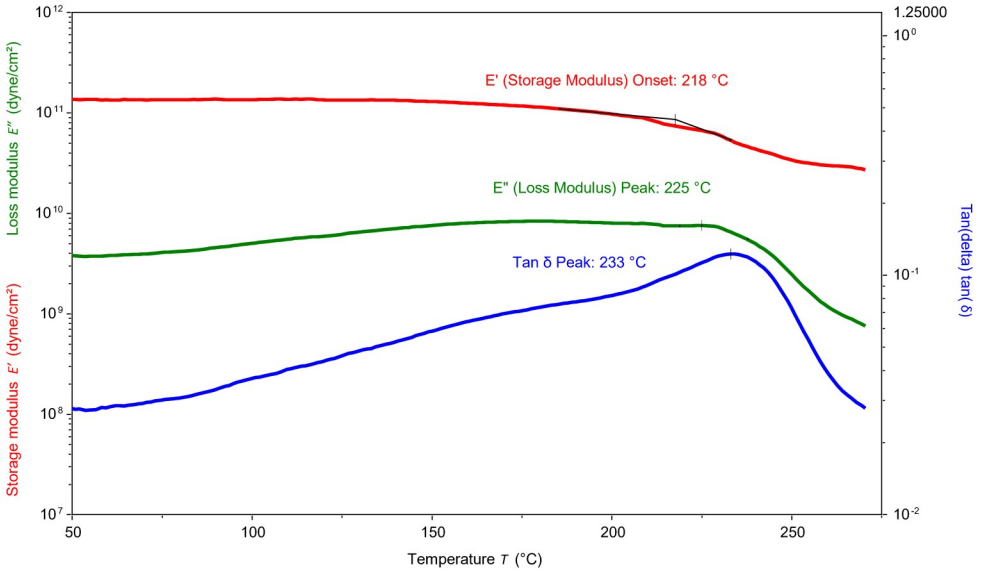
Composite Properties

Reinforcement: Intermediate modulus, 12K tow carbon fiber: IM10-GS-12K 33% RC.
Cure cycle: 4 hours at 177°C (350°F) via vacuum bag oven cure, tests conducted at 22°C (72°F)

Properties	Metric	English	Test Method
0° Tensile Strength	1.66 GPa	241 kpsi	ASTM D3039
0° Tensile Modulus	186 GPa	27 Mpsi	ASTM D3039
0° Tensile Percent Strain	0.89 %		ASTM D3039
90° Tensile Strength	24.8 MPa	3.6 kpsi	ASTM D3039
0° Compressive Strength	0.90 GPa	131 kpsi	ASTM D6641
90° Compressive Strength	145 MPa	21 kpsi	ASTM D6641
Short Beam Strength	106 MPa	15.4 kpsi	ASTM D2344
Flexural Strength	1.82 GPa	264 kpsi	ASTM D790
Flexural Modulus	179 GPa	26 Mpsi	ASTM D790

Composite DMA Tg

TR1187 Resin with fiber reinforcement: Intermediate modulus, 12K tow carbon fiber: T1100SC-12K-50C, 35% RC.
Cure cycle: 4 hours at 177°C (350°F) via vacuum bag oven cure
Tg test conducted in accordance with ASTM D7028
Instrument Setup: Strain-controlled rheometer, 3-point-bend geometry, Frequency: 6.2832 rad/s, *Strain %: 0.005



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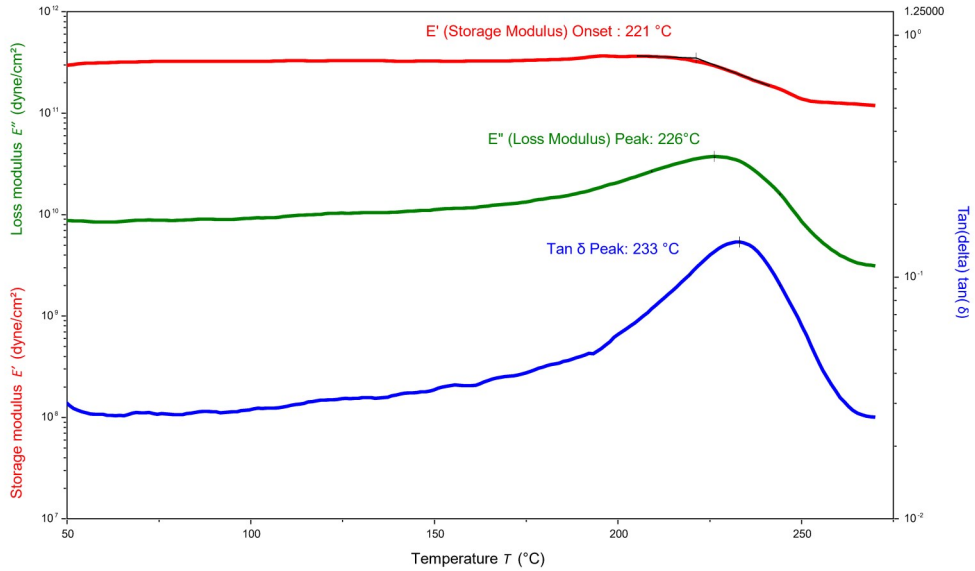

*The rheometer strain % setting is selected after conducting an initial strain sweep on the specific test samples to determine the LVR (Linear Viscoelastic Region)

Cure Profile

Option	Ramp Up	Temperature	Hold Time (hours)	Ramp Down
1	≤ 0.77°C/min (1.38°F/min)	177°C (350°F)	4	≤ 2.5°C/min (4.5°F/min)

All values presented within this technical data sheet are expected ranges based on actual test data. Since values are dependent on specimen preparation and test method, TCR Composites cannot guarantee that these properties will be obtained in all cases. Data should be used only as an indication, since part or component properties are highly dependent on user process and design. It is recommended that end users determine the suitability of this material for each application through their own testing and evaluation.