Toray E732

Toray Advanced Composites

PRODUCT DATA SHEET

DESCRIPTION

Toray E732 is a snap cure toughened epoxy resin matrix optimized for press curing (compression molding) prepreg applications. With a cure time of 4 minutes at 160°C (320°F), an onset T_g of 170°C (338°F) is achieved. At this higher temperature, medium-to-high production rates can be accomplished, with customers able to produce beyond 50,000 parts per year.

Toray E732 is a versatile matrix with a range of processing options allowing a variety of automotive and industrial applications to be realized.

FEATURES

- **Hot-in hot-out press processing**
- **Good surface finish and aesthetics**
- **Controlled resin flow for ease of processing**
- **Full Tg of 170°C (338°F) reached in 4 minutes at 160°C (320°F)**
- **Short cure cycles between 120°C (248°F) to 160°C (320°F)**
- **Low tack for easy lay-up**

PRODUCT TYPE

120°C (248°F) to 160°C (320°F) Cure
Compression Molding Toughened Epoxy Component Prepreg

TYPICAL APPLICATIONS

- Compression molding
- Automotive accessories
- Sport and recreation components e.g., bicycle frames and parts

SHELF LIFE

Out Life:	21 days at 18°C (64°F)
Frozen Storage Life:	6 months at -18°C (< 0°F)

Out life is the maximum time allowed at room temperature before cure.

To avoid moisture condensation: Following removal from cold storage, allow prepreg to reach room temperature before opening the polythene bag.

TYPICAL NEAT RESIN PROPERTIES

Density (ASTM D792-13)	1.24 g/cm³ (77.4 lbs/ft³)
Flow at 100 psi (ASTM D3531 M)	26.3% at 140°C (293°F)
T_g (DMTA) after 4 mins at 160°C (320°F)	Onset: 160°C (320°F) Peak tan δ: 190°C (374°F)
T_g (DMTA) after 10 mins at 140°C (284°F)	Onset: 159°C (318°F) Peak tan δ: 193°C (379°F)

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TYPICAL LAMINATE PROPERTIES

Standard Modulus 3K Carbon 205gsm 2x2 Twill 42% RC				
Property	**Condition**	**Method**	**Laminate**	
Tensile Strength 0°	RTD	BS EN ISO 527-4	713 MPa	103.4 ksi
Tensile Modulus 0°	RTD	BS EN ISO 527-4	59.8 GPa	8.7 Msi
Poisson's Ratio	RTD	-	0.04	-
Tensile Strength 90°	RTD	BS EN ISO 527-4	586 MPa	85.0 ksi
Tensile Modulus 90°	RTD	BS EN ISO 527-4	58.4 GPa	8.5 Msi
Poisson's Ratio 90°	RTD	-	0.06	-
Compressive Strength 0°	RTD	prEN 2850 B1 & B2	660 MPa	95.7 ksi
Compressive Modulus 0°	RTD	prEN 2850 B1 & B2	50.6 GPa	7.3 Msi
Compressive Strength 90°	RTD	prEN 2850 B1 & B2	675 MPa	97.9 ksi
Compressive Modulus 90°	RTD	prEN 2850 B1 & B2	51.2 GPa	7.4 Msi
Flexural Strength 0°	RTD	BS EN ISO 14125	847 MPa	122.8 ksi
Flexural Modulus 0°	RTD	BS EN ISO 14125	51.9 GPa	7.5 Msi
Flexural Strength 90°	RTD	BS EN ISO 14125	897 MPa	130.1 ksi
Flexural Modulus 90°	RTD	BS EN ISO 14125	52.5 GPa	7.6 Msi
In-Plane Shear Strength	RTD	prEN 6031	105 MPa	15.2 ksi
In-Plane Shear Modulus	RTD	prEN 6031	3.86 GPa	0.56 Msi
Poisson's Ratio 0°	RTD	prEN 6031	0.8	-
Interlaminar Shear Strength 0°	RTD	BS EN ISO 14130	63.8 MPa	9.3 ksi
Interlaminar Shear Strength 90°	RTD	BS EN ISO 14130	59.2 MPa	8.6 ksi
Mode I Interlaminar Fracture Toughness (G_{IC} Strain Energy Release Rate)	RTD	prEN 6033	420 J/m²	-

Press cured 10 minutes at 140°C (284°F) at 45 psi
Data at Vf 50.9%. Test conditions were at room temperature

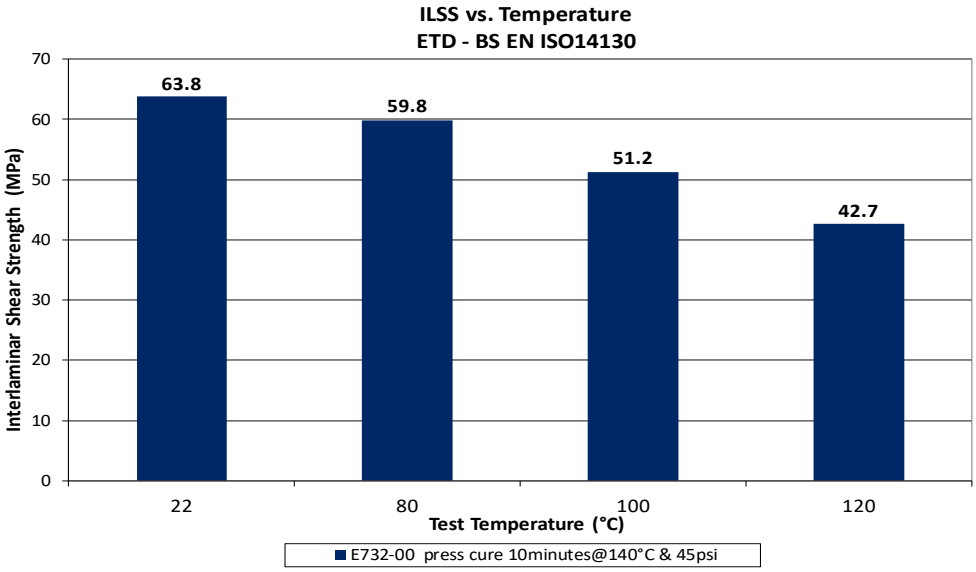
PRODUCT DATA SHEET

T300 3K 205gsm 2x2 Twill (HS0804), E732, 42% Resin Content - Press Cured @ 160°C (320°F) for 5 mins (Hot In / Hot Out)					
Mechanical Properties	**Test Method**	**RTD**		**ETW**	
SBS 0°	ASTM D2344	77.6 MPa	11.3 ksi	40.9 MPa	5.9 ksi
Compression Strength 0°	pr EN2580	712 MPa	103.3 ksi	499 MPa	72.4 ksi
Compression Modulus 0°	pr EN2580	57.0 GPa	8.3 Msi	56.0 GPa	8.1 Msi
Compression Strength 90°	pr EN2580	704.7 MPa	102.2 ksi	578.9 MPa	84.0 ksi
Compression Modulus 90°	pr EN2580	59.3GPa	8.6 Msi	56.5 GPa	8.2 Msi
Tensile Strength 0°	ASTM D3039	647 MPa	93.8 ksi	710 MPa	103.0 ksi
Tensile Modulus 0°	ASTM D3039	64.6 GPa	9.4 ksi	60.5 GPa	8.8 Msi
Poisson's Ratio	ASTM D3039	0.05	0.05	-	-
Tensile Strength 90°	ASTM D3039	591 MPa	85.7 ksi	640 MPa	92.9 ksi
Tensile Modulus 90°	ASTM D3039	64.6 GPa	9.4 Msi	64.3 GPa	9.3 Msi
IPSS Ultimate	ASTM D3518	115.4 MPa	16.7 ksi	84.3 MPa	12.2 ksi
IPSM	ASTM D3518	3.60 MPa	0.5 ksi	2.20 MPa	0.3 ksi
Poisson's Ratio	ASTM D3518	0.82	0.82	0.90	-
Open Hole Compression	ASTM D6484	314 MPa	45.5 ksi	243 MPa	35.2 ksi
Compression After Impact (1500 in-lb/in, 6.7 J/mm)	ASTM D7137	186 MPa	27.0 ksi	-	-

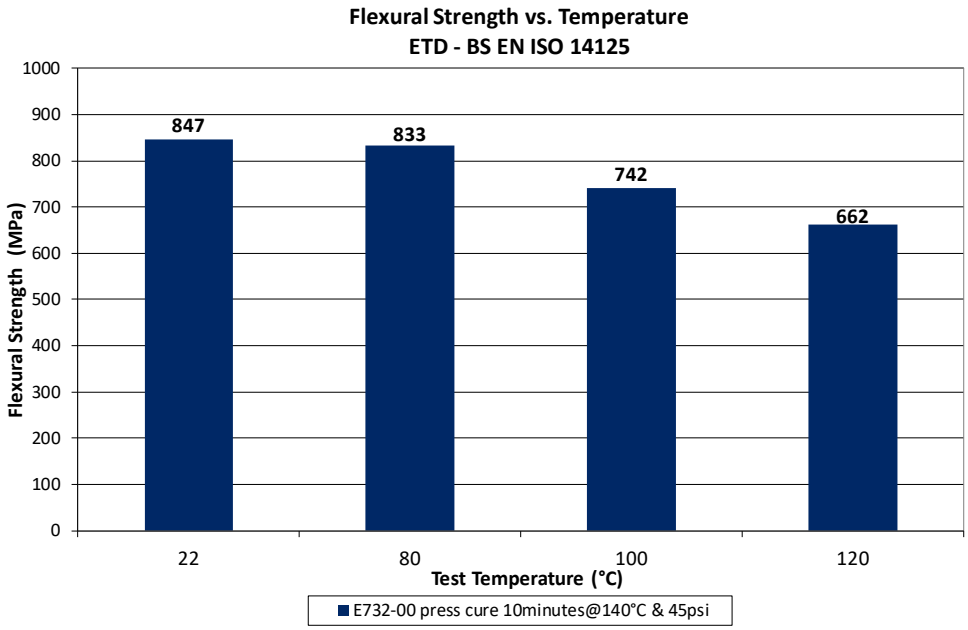
Results were normalized to 55% Vf except IPSS, IPSM
Room Temperature Dry (RTD) at 21°C (69.8°F)
Elevated Temperature Wet (ETW) is tested at 82°C (180°F) after 14 days of conditioning in hot water bath at 71°C (160°F)

RETENTION OF MECHANICAL PROPERTIES

Elevated Temperature Dry (ETD) Press Cured 10 Minutes at 140°C (284°F) at 45 psi

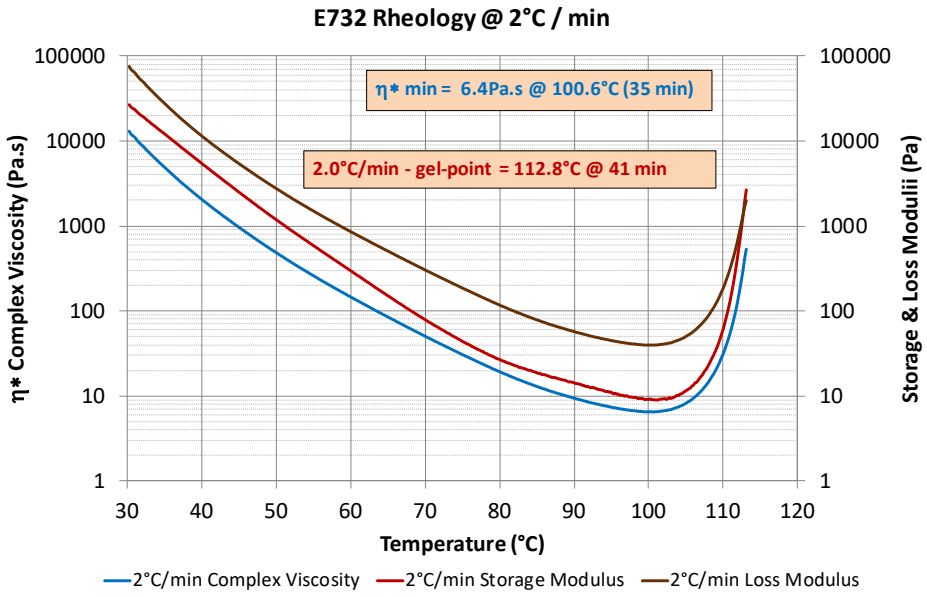


Interlaminar Shear Strength (ILSS) vs. Temperature of Standard Modulus 3K Carbon 205gsm 2x2T 42% RC E732 Laminate

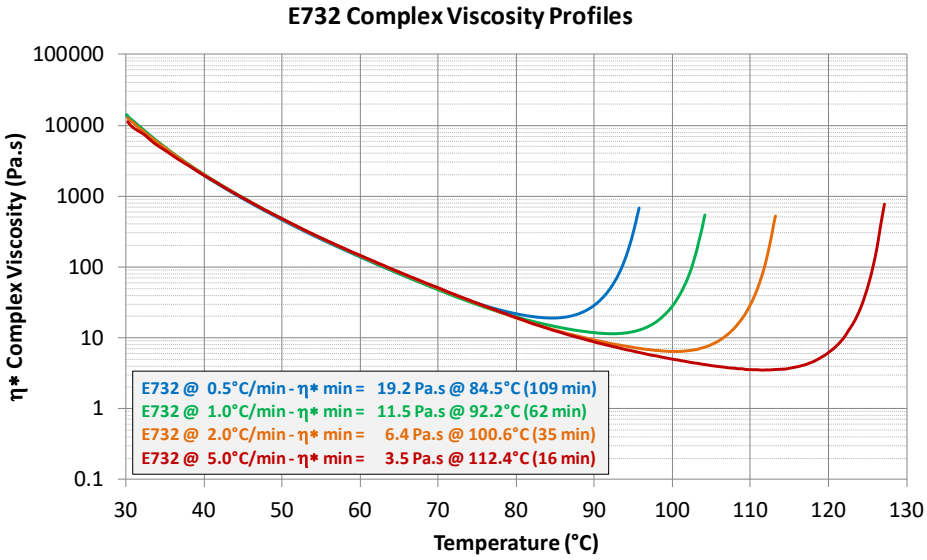


Flexural Strength vs. Temperature of Standard Modulus 3K Carbon 205gsm 2x2T 42% RC E732 Laminate

RHEOLOGY



VISCOSITY



PROCESSING

Cut patterns to size and lay-up the laminate in line with design instructions, taking care not to distort the prepreg. If necessary, the tack of the prepreg may be increased by gentle warming with hot air.

CURE CYCLES

During compression molding, the resin will flow until the gel-point. After the recommended cure time, a 2-mm (0.78 inch) thick part will have generated a T_g in excess of the cure temperature. The table below provides information regarding gel times and cure times. The absence of cool-down and heat-up rates has obvious benefits for part throughput, facilitating part fabrication efficiency.

Dwell Temperature	Gel Time (Seconds)	Minimum Dwell Time (Minutes)	Recommended Dwell Time (Minutes)
120°C (248°F)	240	-	20
130°C (266°F)	150	-	15
140°C (284°F)	90	6	10
150°C (302°F)	60	4	5
160°C (320°F)	45	3	4

Alternative cure cycles and molding techniques may be employed. Please consult a member of our expert services team at our Langley Mill address for advice on specific cure requirements.

TYPICAL HOT-IN HOT-OUT CURE PROFILES

160°C (320°F) Cure Temperature		
Dwell	160°C (320°F)	Hold for 4 minutes followed by demold
Total time: 4 minutes		

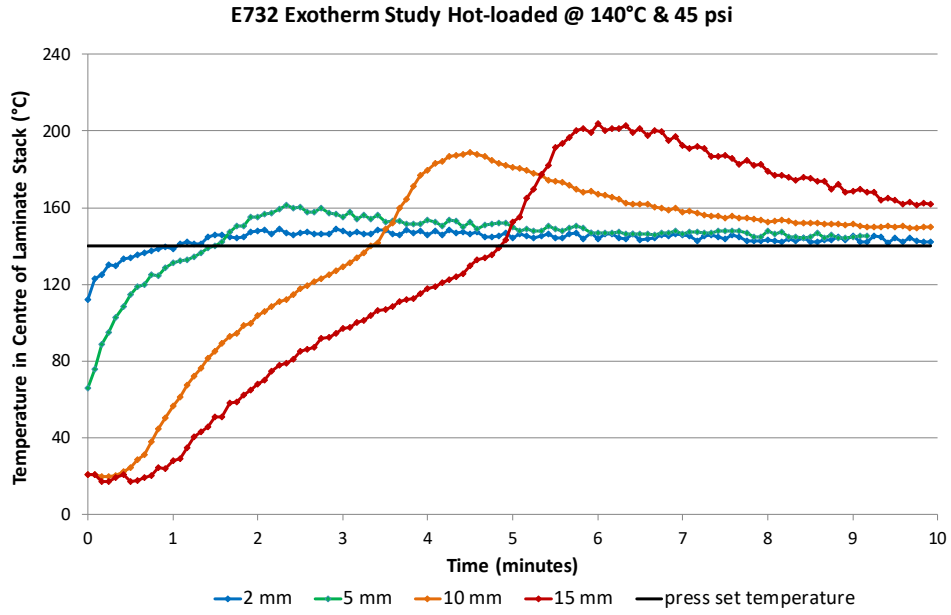
150°C (302°F) Cure Temperature		
Dwell	150°C (302°F)	Hold for 5 minutes followed by demold
Total time: 5 minutes		

140°C (284°F) Cure Temperature		
Dwell	140°C (284°F)	Hold for 10 minutes followed by demold
Total time: 10 minutes		

EXOTHERM

In certain circumstances, such as the production of thick section laminates rapid heat-up rates or highly insulating masters, Toray E732 can undergo exothermic heating leading to rapid temperature rise and component degradation in extreme cases. Where this is likely, a cure incorporating an intermediate dwell is recommended in order to minimize the risk.

Caution must be exercised in ensuring safe dwell temperatures and lay-up procedures are adhered to, especially when molding solid laminates in excess of 5 mm (0.20 in) thickness. Note that the risk of thermal runaway increases with lay-up thickness and cure temperature.



HANDLING SAFETY

Observe established precautions for handling epoxy resins and fibrous materials—wear gloves. For further information, refer to Safety Data Sheet.

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