

SE 85GT

Epoxy Prepreg System

- **Highly impact resistant**
- **Rubber toughened system - excellent resistance to micro-cracking**
- **Controlled flow**
- **Good surface finishes possible**
- **Self adhesive - high peel strengths**

Introduction

The SE 85GT series are highly toughened hot-melt, epoxy prepregs that offer an extremely good balance of mechanical properties. They are ideal for structural components where improved impact performance and resistance to resin microcracking is desired. SE 85GT can be cured at 80°C, yet retains an outlife of up to 56 days at 23°C. With its $\frac{3}{4}$ hour cure at 120°C, it is also suitable for the quick manufacture of parts, and is also used in the development of trial components.

■ SE 85GT has medium flow characteristics, so that heavy reinforcements can be easily wet out, and good consolidation can be achieved in very thick (>25mm) laminates, under just vacuum bag pressures. Its flow behaviour also means that it can produce excellent surface finishes when used in pressure-moulded components.

■ SE 85GTBL is a black pigmented variant, often used in carbon fabrics to provide an excellent deep black gloss finish on the outer surface of carbon components such as yacht spars and race car parts.

SE 85GT system can equally be used in sandwich structures with honeycomb and foam cores. In this application, depending on resin content, it can be used in a self-adhesive mode, although it is more commonly used in conjunction with the toughened SA 80 Adhesive Film. (See separate datasheet).

Processing Notes - General

Preparation

When preparing the lay up the prepreg should be removed from the freezer approximately six to eight hours prior to use and allowed to thaw in a sealed bag. This prevents atmospheric moisture from condensing on the prepreg which may cause voiding on cure. The mould surface should be release coated and must have been tested for vacuum integrity prior to lay-up.

Laying-Up

The following procedure is recommended for preparing vacuum cured laminates.

1. Place the lay-up on a tool or caul sheet which has been treated with a release agent or film. Insert a thermocouple into the lay-up near the centre ply of the thickest edge section, outside the net trim line. A separate prepreg nylon peel ply is available for covering a mould tool prior to layup in order to leave a clean, textured surface for subsequent bonding.
2. Apply a prepreg peel ply or dry to the surface of the lay-up. Note that for good secondary bonding of a peel-plyed surface of an SE 85 prepreg laminate, a nylon peel ply, such as SP-High Modulus' Stitch Ply A, is strongly recommended. This is particularly important where the cure temperatures are in excess of 90°C. Cover the peel ply entirely with a perforated release film. Normally, no edge resin bleeder system is used. For thin sections, SP's WL3600P90 grade release film are recommended, while for sections of 4mm and above, SP-High Modulus' WL3600P3 release film is also suitable. With WL3600P3 the amount of resin bled away is controlled by the number of dry plies of resin bleeder cloth placed over the perforated release film.
3. Install a vacuum bag by standard techniques. Insert at least two vacuum stems through the bag connecting one to the vacuum source and the other, at a point on the part furthest from the source, to a calibrated vacuum gauge. Position part in the oven or autoclave and draw vacuum to check for bag or system leaks.
4. Commence the heat-up cycle, typically between 0.3°C/min and 2°C/min to the final cure temperature. At 85°C, the temperature should be held for 10 hours. Faster cures may be obtained at elevated temperatures, e.g. 4 hours @ 100°C, or $\frac{3}{4}$ hour @ 120°C. All temperatures measured by the previously installed thermocouple. When curing at 80°C, a minimum of 12 hours is recommended. Vacuum should be maintained as high as possible, with a minimum of 85% throughout the cure cycle.
5. Upon completion of cure, turn off heat and cool until part temperature has fallen below 60°C. When fully cooled, the part may be debagged, trimmed and machined as necessary. A post-cure is not required.

Processing Notes - Curing

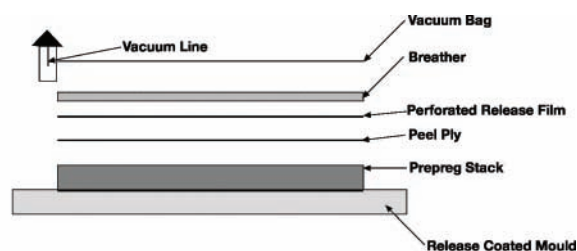
Cure Cycles

For a good balance of composite properties, it is recommended that the laminate is cured at 85°C for a minimum of 10 hours. A laminate may be cured in two stages - if, for example, making a cored component. However in a

two stage cure, a minimum of 4 hours at 85°C or 5 hours at 80°C is recommended before debagging a skin, and it must be ensured that this skin is cured for the equivalent of at least 10 hours at 85°C or 12 hours at 80°C before going into service.

SE 85GT may be cured at higher temperatures for a shorter time. At a cure temperature of 100°C (212°F) cure can be achieved in 3 hours or at 120°C (250°F) cure can be achieved in 45 minutes.

It is not recommended to cure SE 85GT under vacuum pressures of less than 80%. If a ramp rate of less than 0.3°C/min is used, users should satisfy themselves that this allows adequate flow.



Curing at 80°C

When curing at 80°C it is important that several thermocouples are used and that the temperature is monitored off the trailing thermocouple. 80°C should be treated as the minimum cure temperature for SE 85GT; 70-75°C will not generate adequate mechanical properties.

Thin Laminates

When using very thin laminates (eg with a total laminate fibre weight of less than 600 gm²), care needs to be taken to avoid extracting excessive amounts of resin during the cure process. To avoid this, a reduced pressure cure cycle should be employed, as follows:

First debulk the laminate at between 20 - 30°C under full vacuum for one hour. Then increase the temperature to 80°C while simultaneously reducing the vacuum to 50 - 70%.

Alternatively, a perforated release film with fine widely spaced holes may also be suitable.

Core bonding

Various core materials can be used with the prepreg system, including foams and honeycombs. However, due to the wide variety of PVC and other foams available, and the cure temperatures involved, special procedures have been developed which must be carefully followed. For details of these processes, please contact Technical Services.

When using Nomex™ or aluminium honeycombs and low cure temperatures (80-110°C) the separate SA 80 adhesive film is recommended and full details of use are provided on the separate SA 80 data sheet. This adhesive film is supplied on a lightweight glass carrier, or in some cases it can be supplied directly coated onto one face of the SE 85GT prepreg.

The system is fully compatible with Ampreg 20 and Ampreg 26 wet layup epoxy systems and therefore all types of cores may be bonded to a first skin by using a separate 'wet-bonding' operation. In this case, the addition of filler powders to the appropriate resin system is required to provide the correct paste-like consistency.

When press-moulding in a 'hot-in, hot-out' cycle at 140°C ±20°C, an SE 85GT prepreg of adequate resin content may be used in a self-adhesive mode on honeycomb cores. Outside of these conditions a separate SA 80 adhesive film should be used.

Availability

Small quantities of a black pigmented version of SE 85GT on RC 200T and RC 280T4 are usually held in stock but other SE 85GT prepregs are available in a wide variety of fabric forms and collimated unidirectional tapes. Unidirectional materials are normally supplied on a single release paper and fabrics on a single polythene film. Please contact Technical Services to discuss specific requirements and availability.

Properties

Uncured Properties	
Out-Life @ 18-22°C	8 wks
Storage Life @ -18°C	2 years
Hazard Designation	Xi
Risk Phrases	36/38, 43, 52/53
Safety Phrases	24, 26, 28, 37/39, 60, 61

Working Properties	
Minimum Cure Temperature (°C)	80
Min. Cure Time (@ min. cure temp.) (hrs)	12
Min. Visc. (iso. @ min. cure temp. (P)	TBA
Min. Viscosity (1°C/min. ramp) (P)	42
Temp. @ min. Visc. (1°C/min. ramp (°C)	100
Minimum Cure Time @ 90°C (hrs:mins)	6:00
Minimum Cure Time @ 100°C (hrs:mins)	3:00
Minimum Cure Time @ 110°C (hrs:mins)	1:30
Minimum Cure Time @ 120°C (hrs:mins)	0:45

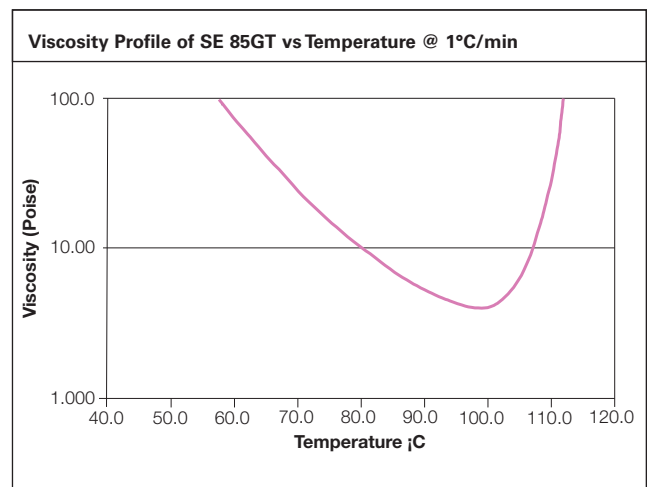
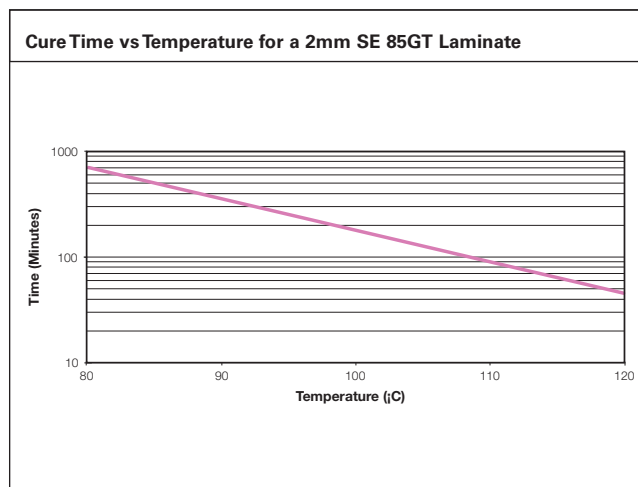
Cured System Physical Properties		
	Cure	
Tg DMTA (Peak Tan δ)(°C)	12 hrs @ 80°C	116.6
Tg1 DMTA (°C)	12 hrs @ 80°C	103
Tg1 DMTA (°C)	45 minutes @ 120°C	103
Cured Resin Density (g/cm³)	45 minutes @ 120°C	1.21

Notes: For an explanation of test methods used see 'SP-High Modulus Prepregs Technical Characteristics'.

All figures quoted are indicative of the properties of the product concerned. Some batch to batch variation may occur.

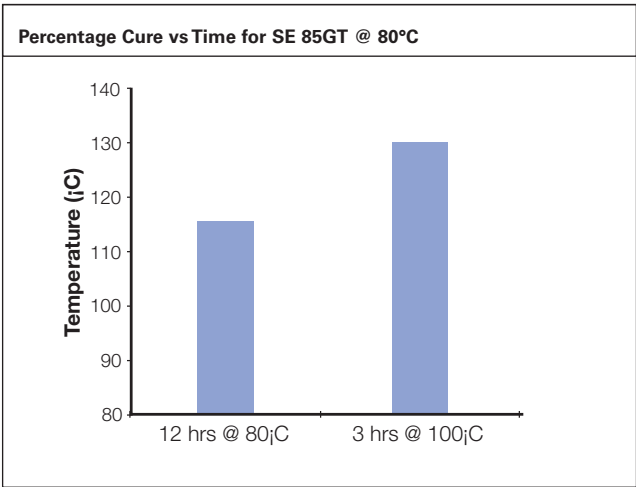
Properties (cont'd)

Mechanical Properties			
	SE 85GT / HSC / 300 / 400 35±2%	RC200T Woven 2x2 Twill HS Carbon	RC280T4 Woven 4x4 Twill HS Carbon
Cure (time / temperature / pressure)	1 hr / 125°C / 6 bars	1 hr / 125°C / 6 Bar	1 hr / 125°C / 6 Bar
Process	press	press	press
Fibre Weight (g/sqm)	300	194	280
Prepreg Areal Weight (g/sqm)	460	334	483
Prepreg Resin Content (%bw)	35 ±2%	42 ±3%	42
Flexural Strength (MPa)	1350	840	779
Flexural Modulus (GPa)	106	52.7	48
Cured Ply Thickness (mm)	0.3	0.2	0.28
Compressive Strength (MPa)	965	695	524
Compressive Laminate Fibre Volume (%)	-	-	-
Normalised Compr. Strength @ 60% FVF (MPa)	-	-	-
Toughness G_{IIC} (kJ / m ²)	2.14	1.81	2.25
Microcracking Strain to First Crack (% strain)	0.8	TBA	TBA
ILSS (MPa)	77	68	64



Notes: For an explanation of test methods used see 'SP-High Modulus Prepregs Technical Characteristics'.
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Properties (cont'd)



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Health and Safety

Although SE 85GT prepregs have greatly improved health and safety characteristics when compared to wet lay-up epoxy systems, the following points must still be considered:-

1. Avoid skin contact - wear disposable rubber gloves and use skin barrier creams.
2. Avoid eye contact. If this occurs, flush with water for 15 minutes and seek medical advice.
3. Ensure good ventilation of vacuum pump exhaust during laminate cure.
4. Avoid inhalation and eye contact with sanding dust. After any sanding operation of reasonable size a shower or bath should be taken and should include hair washing.
5. Wear overalls or other protective clothing. Thoroughly clean or discard soiled garments.
6. Use only resin removing creams/soap and water on exposed skin. Do not use solvents.

Washing should be part of routine practice:

- before eating or drinking
- before smoking
- before using the lavatory
- after finishing work

Gurit produces a separate full Materials Safety Data Sheet for this product covering usage, transport, storage and emergencies. Please ensure that you have the correct MSDS's to hand for the materials you are using before commencing work.

Applicable Risk & Safety Phrases

R 36/38, 43, 52/53
S 24, 26, 28, 37/39, 60, 61



Transport & Storage

When not in use SE 85GT products should be maintained at -18°C. Shelf life for SE 85GT is two years at -18°C and six weeks at 18-22°C. To avoid condensation on their surfaces, allow rolls to reach room temperature before unwrapping.

Notice

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The Company strongly recommends that Customers make test panels and conduct appropriate testing of any goods or materials supplied by the Company to ensure that they are suitable for the Customer's planned application. Such testing should include testing under conditions as close as possible to those to which the final component may be subjected. The Company specifically excludes any warranty of fitness for purpose of the goods other than as set out in writing by the Company. The Company reserves the right to change specifications and prices without notice and Customers should satisfy themselves that information relied on by the Customer is that which is currently published by the Company on its website. Any queries may be addressed to the Technical Services Department.

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