

Description

Ep-preg® **S153** is an epoxy prepreg suitable for vacuum curing process. It has been designed to be easy to work with in terms of handling and processing.

Ep-preg® **S153** has very long shelf life at room temperature, and long out of the bag tack time. Friendly, it can be used for very large composite parts that have to withstand severe weathering and mechanical stresses.

In spite of its high flow matrix, Ep-preg® **S153** gives high quality surface when processed and cured properly. Ep-preg® **S153** is available in all reinforcements and represents a great choice for many industrial applications.

As typically for wind blades, **S153** is available in all types of E-glass fiber, such as stitched unidirectional, stitched ±45° (biaxial), and stitched ±45°/0° (triaxial).

Typical Applications

- ✓ Wind Energy - Blades manufacturing.
- ✓ Marine – Hulls and Decks manufacturing.

Key Features and benefits

- **Prepreg**
 - ✓ Shelf life: **15-16 weeks @ 70°F (21°C)**, and 24 months @ 0°F (-18°C).
 - ✓ Versatile curing temperature: 185-250°F (**85-121°C**).
 - ✓ Suitable for low pressure: 1-3 bar.
 - ✓ Self-adhesive for core materials and secondary bonding.
 - ✓ Excellent flexibility and handling, with high tack from both sides.
 - ✓ Suitable for thin and thick laminates.
- **Laminate**
 - ✓ Superior mechanical properties.
 - ✓ Good surface finish.
 - ✓ Good fatigue and weather resistance.

Cured Matrix Properties

	2 hrs @ 120°C	Method
Tensile Strength (MPa)	77 ± 2	ISO R527
Tensile Modulus (GPa)	3.1 ± 0.1	ISO R527
Strain (%)	3.7 ± 0.1	ISO R527
Flexural Strength (MPa)	132 ± 5	ISO R178
Flexural Modulus (GPa)	3.05 ± 0.1	ISO R178
Strain (%)	8 ± 1	ISO R178
Compression Strength (MPa)	100 ± 2	ASTM D695
Compression Modulus (GPa)	3.2 ± 0.1	ASTM D695
Fracture toughness K _{1C} (MPa√m)	0.8 ± 0.05	ISO 13586
Fracture energy G _{1C} (J/m ²)	230 ± 20	ISO 13586
Density (g/cm ³)	≈ 1.16	
Glass Transition Temp. (°C)	112 ± 2	DSC - 10°C/min



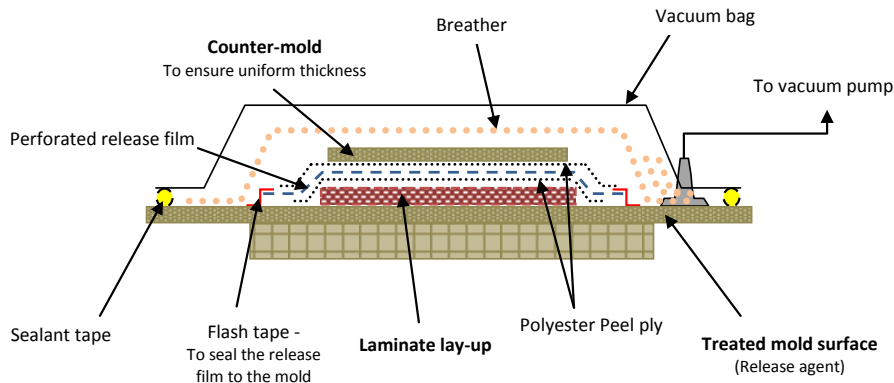
Oven Vacuum Curing Cycle

- Apply 24" Hg vacuum for 5-10 minutes before beginning heat cycle.
- Raise laminate temperature from room temperature to 185°F (85°C) within 30-45 min.
- Hold laminate at 185°F (85°C) for **30 min.**
- Raise laminate temperature from 185°F (85°C) to 250°F (121°C).
- Hold laminate at 250°F (121°C) for **120 min.**
- Cool the laminate to at least 176°F (80°C), prior to release vacuum pressure.

Alternative Vacuum Curing Cycle

Temperature (°F/°C)	Gel time (min)	Dwell time (Hrs.)	DSC T _g (°C)
185/85	110-130	6	95-100
194/90	70-75	4	95-100
212/100	30-35	6	110-115
230/110	13-15	4	110-115

Recommended Bagging Arrangement



Note down

- ❖ It must be understood that the curing time starts only after the prepreg temperature achieves the recommended temperature. The **use of a thermocouple is a must** to monitor the actual prepreg temperature.
- ❖ In case of vacuum bag processing, one ply of lightweight breather, 120 gsm, is recommended. A heavyweight breather, 340 gsm, has to be used in case of Autoclave processing. In both cases, two or three additional layers of breather have to be applied locally beside the vacuum ports.



Curing Specifications

Minimum		Method
Curing temperature (°C)	85	DSC
Curing time (Hr : min) @ minimum temp.	6:00	DSC
Glass transition temp. T _g (°C)	97	DSC
Viscosity – 40 to 120°C @ 1°C/min – (Poise)	36.17	Rheometer
Temperature @ minimum viscosity (°C)	108.9	Rheometer

Vacuum Cured Laminate Properties

Cured 30 min @ 85°C & 2 hrs. @ 120°C

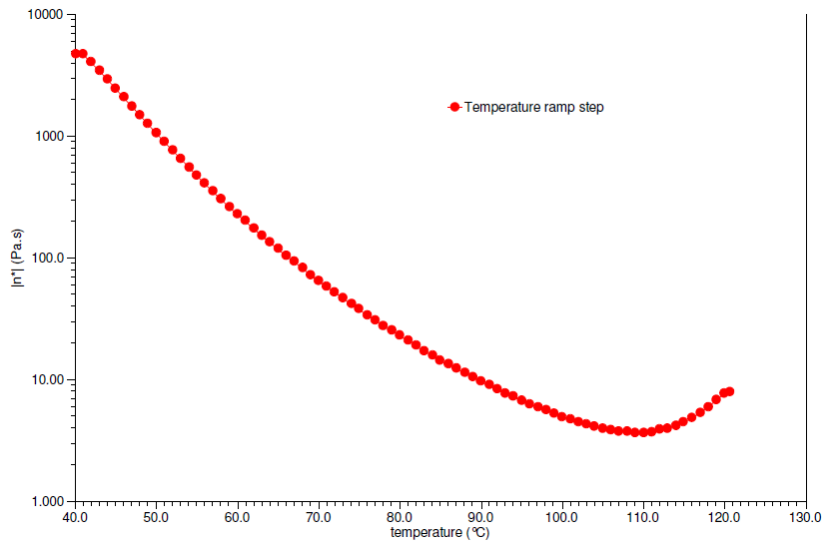
Properties	E-Glass						T 700	Test Method
	Stitched UD		Triax 0/±45		Biax ± 45		12K UD	
Fiber weight (gsm)	1152	1594	900		600		309	
Resin Content by weight (%)	32	32	38		50		44	
Number of layers	2	2	3		4		5	
Cured laminate thickness (mm)	1.8	2.2	2.3		2.5		1.9	
Laminate fiber volume (%)	50.3	57.8	45.9	45.9	37.8	37.8	50	
Tensile & Flexural Values in (°)	0	0	0	45	45	0	0	
Tensile strength (MPa)	1023	1217	440	151	348	125	1570	BS EN ISO 527-4
Tensile modulus (GPa)	39.5	45.9	33	12	18.2	7.5	115	BS EN ISO 527-4
Flexural Strength (MPa)	1074	-	620	293	490	231	-	BS EN ISO 14125
Flexural Modulus (GPa)	47	-	19	12.6	16.8	8.1	-	BS EN ISO 14125
Normalized @ 53% FVF								
Cured laminate thickness (mm)	1.71	2.37	2.12	2.12	1.78	1.78	1.78	
Tensile strength (MPa)	1077	1080	498	171	488	175	1628	BS EN ISO 527-4
Tensile modulus (GPa)	41.6	42.2	32.1	11.8	25.5	10.6	120	BS EN ISO 527-4
Tensile Stiffness Coef. (GPa*m)	37.6	-	-	-	-	-	-	BS EN ISO 527-4
Flexural Strength (MPa)	1137	-	702	352	688	261	1775	BS EN ISO 14125
Flexural Modulus (GPa)	49.9	-	18.6	12.4	19.6	9.2	120	BS EN ISO 14125
Inter-laminar Values in (°)	0	0	45	0	45	0	0	
Shear Strength (MPa)	75	75	45	28	-	-	90	ASTM D-2344
Shear Strength (MPa)	-	-	-	-	51.5 [■]	-	-	EN-2377

■ 8 layers; L = 26.06 mm; b = 13.45 mm; d = 4.11 mm.



Rheology Profile

Minimum viscosity: 3.617 Pa.s @ 108.9°C



Storage and Handling

All prepregs are wrapped in a barrier film immediately after impregnation. During storing and handling, the following notes must be considered:

- Prepregs should be stored in their original packaging barrier film, or an equivalent film, at -18°C.
- Before use, the prepreg roll has to be out of the freezer and remain tightly sealed for 48 hours, time required to reach ambient room temperature.
- It is highly recommended to handle the prepreg at a clean area where relative humidity is ≤ 50% and ambient temperature is 20-23°C.

Safety Precautions

Usual precautions, as following, must be considered:

- During lamination, workers must avoid skin contact by wearing appropriate disposable protective gloves.
- Clean protective coveralls or equivalent clothes must be worn before laminating and also sanding.
- Protective glasses must be worn to avoid eyes contamination. In case of contamination, eyes must be flushed for 15 min and then medical treatment must be applied.
- After working, hands and contaminated skin, if any, have to be washed with soap and warm water. This has to be implemented as a routine practice.

Important Notice

The data reported in this sheet are based on representative samples. Since the method and circumstances of handling and processing are keys to the material performance, Gulf Composite Materials does not guaranty these data. Users should make their own assessment of the suitability of any product for the performance required.

