

## EP-PREG® T433 194-275°F (90-135°C) CURING EPOXY PREPREG

### DESCRIPTION

Ep-preg® T433 is a toughened epoxy prepreg suitable for vacuum curing process. It has been designed to endure high impact, severe weathering and mechanical stresses. Ep-preg®T433 is available in different glass and carbon reinforcements. A high-quality surface is easy to obtain when the prepreg is processed and cured properly.

Differential Thermal Analysis (DTA) isothermal curing at 135°C showed thinner and higher exothermic peak than a cure at 120°C. Resin flow and pressure need careful attention if curing at 135°C to avoid excessive resin flow.

DTA thermograms of neat T433 resin showed full curing times of 60 min and 30 min respectively, under isothermal cure at 120°C and 135°C. is required to achieve a nearly full curing.

No residual curing peaks were observed for longer dwell time or when adding a short (15 min) isothermal segment at 150°C. Glass transition temperature ( $T_g$ ) of cure T433 resin at 135°C/60 min (and 150°C/15 min) was measured by DTA and found in the range of 122-125°C.

### KEY FEATURES AND BENEFITS

- Long storing life, 5-6 weeks @ 20°C, 4-5 months @ 4°C & 18 months @ -18°C
- Versatile curing temperature 194-275°F (90-135°C)
- Suitable for low pressure curing (1 bar)
- Self-adhesive for core materials and secondary bonding
- Good flexibility and easy handling
- Environmentally friendly and retains its tack for several weeks
- Suitable for thin and thick laminates
- Superior fracture toughness, up to 1.8 MPa√m, and energy, up to 900 J/m<sup>2</sup>
- Excellent surface finish
- Good mechanical properties

### PHYSICAL PROPERTIES WITH STANDARD REINFORCEMENTS

Fiber	E-Glass	Carbon		
		3K 0/90	6K 0/90	12K UD
Weave	8H 7781	3K 0/90	6K 0/90	12K UD
Fiber Area Weight (g/m <sup>2</sup> )	300	200	320	300
Resin Content by Weight, R.C. (%)	40±2	42±2	42±2	37±2
Prepreg Roll Width (cm)	100 / 127	102 / 127	102 / 127	60 / 120
Volatile content (%)	<1	<1	<1	<1
R.C. flowing in vacuum curing 2-3 mm thick laminate (%)	3-4	4-5	4-5	3-4
Vacuum cured 1 ply thickness (mm)	0.266	0.236	0.377	0.318

### TYPICAL APPLICATIONS

- Aircraft structural parts
- Advanced composites requiring good durability and fatigue resistance
- High performance sporting goods
- Racing vehicles

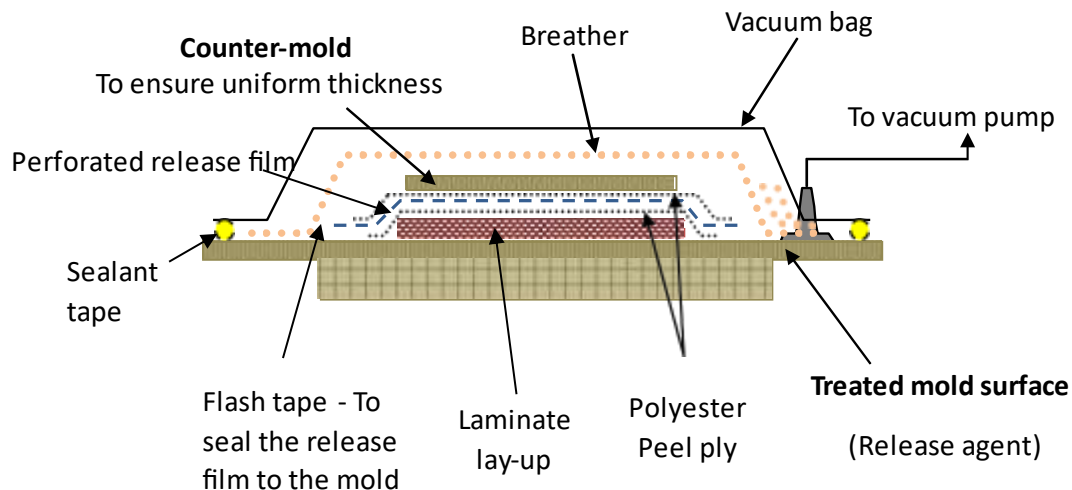
## TYPICAL OVEN VACUUM CURING CYCLE

- 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 194°F (90°C) for 30 min.
- Raise laminate temperature from 194°F (90°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.

### Notice:

- 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.

### Recommended Bagging Arrangement



## STORAGE AND HANDLING

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

- Ep-preg® prepregs **must** be stored in their original packaging barrier film, or an equivalent film, **at 4°C or -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  $\leq 52\%$  and ambient temperature is 20-23°C.

**VACUUM CURED STITCHED FIBER LAMINATES**

30 min @ 90°C & 2 hrs @ 120° C

Reinforcement		3K 2X2 T300-3000-40B	7781 E-Glass
Fiber Areal Weight	(gsm)	200	300
Resin Content	(%)	38	36
Laminate Thickness	(mm)	2.5	2.6
Number of layers		12	10
Fiber Volume Fraction	(%)	51.4	44.8
T <sub>g</sub> (dry, by DSC)	(°C)	130±2	
<b>Tensile*</b>	<b>ASTM D-3039</b>		
σ Dry-23°C	MPa/ksi	920/137	570/82.6
σ Wet-70°C	MPa/ksi	855/124	390/56.5
E Dry-23°C	GPa/msi	59/8.6	25/3.6
E Wet-70°C	GPa/msi	56/8.1	23/3.3
<b>Flexural</b>	<b>ASTM D-790</b>		
σ Dry-23°C	MPa/ksi	950/138	590/85.7
σ Wet-70°C	MPa/ksi	860/125	420/61
E Dry-23°C	GPa/msi	56/8.1	24/3.5
E Wet-70°C	GPa/msi	52/7.5	22/3.2
<b>Compression</b>	<b>ASTM D-3410</b>		
σ Dry-23°C	MPa/ksi	820/119	540/78.5
σ Wet-70°C	MPa/ksi	695/101	370/53.9
E Dry-23°C	GPa/msi	56/8.1	24/3.5
E Wet-70°C	GPa/msi	52/7.5	22/3.2
<b>Inter-laminar Shear</b>	<b>ASTM D-2344</b>		
σ Dry-23°C	MPa/ksi	75/10.9	63/9.1
σ Wet-70°C	MPa/ksi	41/6.0	37/5.4

\* Tensile strength is normalized to 60% FVF, in case of carbon, and 53% FVF, in case of glass.

**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.

DTA CURING THERMOGRAMS

