Gulf Composite Materials L.L.C

Ep-preg® F64-A1

FR Epoxy 194-250°F (90-121°C) Curing Prepreg

Product Data Sheet

Description

Ep-preg® **F64-A1** is a fire retardant epoxy prepreg suitable for vacuum curing process. Its fire behavior meets with **FAR 25.853** - F part 1. It has been designed to offer a great harmonizing between mechanical and fire resistance performances.

F64-A1 is a great choice offering cost affective prepreg solution for manufacturing industrial and building composite parts that have to comply with **ASTM E84 Class A**.

F64-A1 has long shelf life at normal ambient room temperature and long out of the bag tack time. It has medium to high flow and allows very good quality surface when processed and cured properly.

Physical Properties on E-Glass 7781

- Standard resin content: 52±3% by weight.
- Standard weight: 625±42 g/m^2.
- Standard tack: medium from one side and low from the other.
- Cured ply thickness at 38% FVF: 0.31 mm.

Typical Applications

- ✓ Automotive and Mass-transit applications.
- ✓ Structural and building components
- ✓ General composites where self-extinguishing could add value.

Key Features and benefits

- **Prepreg**

- ✓ Shelf life: **10-12 weeks** @ 70°F (**21°C**), and 24 months @ 0°F (-18°C).
- ✓ Versatile curing temperature: 194-250°F (**90-121°C**).
- ✓ Suitable for low pressure: 1-3 bar.
- ✓ Self-adhesive for core materials and secondary bonding.
- ✓ Excellent flexibility and handling, with medium tack from one side.
- ✓ Suitable for thin and thick laminates.

- **Laminate**

- ✓ Superior FST performance.
- ✓ Excellent surface finish.
- ✓ Good mechanical performance.

Burning Performance as per FAR 25.853

- **Flammability**

✓ Extinguishing time	Nil
✓ Burn length	Nil
✓ Drip extinguishing time	No dripping

- **Smoke Density @ 4 min.**

✓ With pilot flame	29.08
✓ Without pilot flame	24.05

- **CO Toxicity - *ppm* @ 4 min.**

✓ With pilot flame	380
✓ Without pilot flame	230

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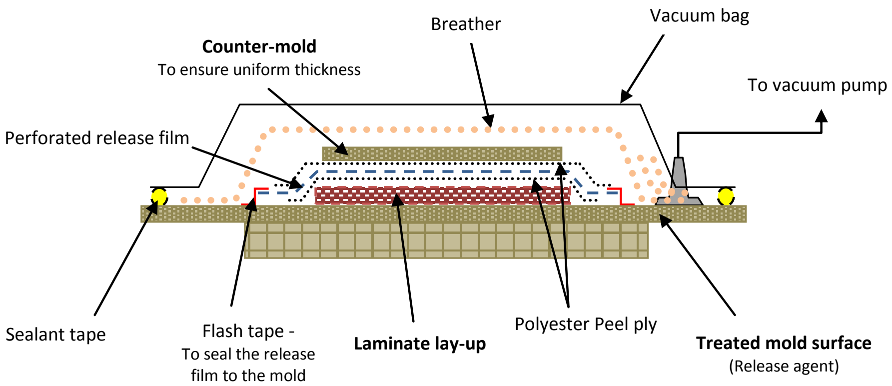
Press Curing Cycle

- Heat the mold tool to 176°F (80°C).
- Place the prepreg material in the mold and apply pressure light pressure, **1 bar** (14-15 psi), **while raising** the temperature to 212°F (**100°C**), at a rate 5-9°F (3-5°C).
- Hold the part in the mold at 212°F (**100°C**), for **10-15 min**, and then raise the temperature to 250°F (**121°C**), while increasing the pressure gradually up to **3-5 bar** (42-70 psi).
- Hold the part in the mold at 250°F (**121°C**), for **100-120 min**, while maintaining the applied pressure.
- Cool the part to at least 176°F (**80°C**), and then release the pressure gradually for part removal.

Oven Vacuum Curing Cycle

- Apply 24" Hg vacuum for 5-10 minutes before beginning heat cycle.
- Raise laminate temperature from room temperature to 194°F (90°C) within 30-45 min.
- Hold laminate at 194°F (**90°C**) for **20 min**.
- Raise laminate temperature from 194°F (90°C) to 250°F (**121°C**).
- Hold laminate at 250°F (**121°C**) for **100-120 min**.
- Cool the laminate to at least 176°F (**80°C**), prior to release vacuum pressure.

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.

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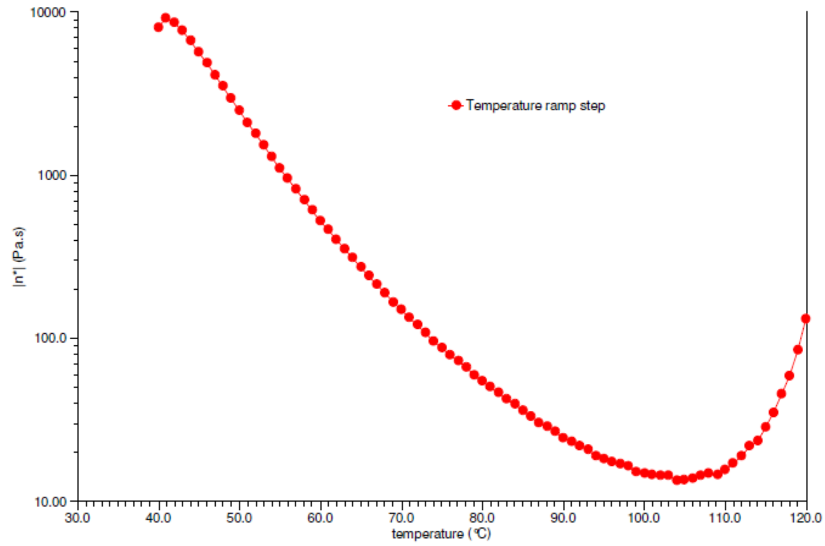
Curing Specifications

Minimum		Method
Curing temperature (°C)	90	DSC
Gel time (min)	15-17	-
Curing time (Hrs.) @ minimum temp.	4	DSC
Glass transition temp. T_g (°C)	95-100	DSC
Viscosity – 40 to 120°C @ 1°C/min – (Poise)	134.3	Rheometer
Temperature @ minimum viscosity (°C)	104	Rheometer

Rheology Profile



Cured Matrix Properties

	2 hrs @ 120°C	Method
Tensile Strength (MPa)	60 ± 5	ISO R527
Tensile Modulus (GPa)	5.0± 0.2	ISO R527
Strain (%)	1-2	ISO R527
Flexural Strength (MPa)	95 ± 5	ISO R178
Flexural Modulus (GPa)	5.5 ± 0.5	ISO R178
Strain (%)	2-3	ISO R178
Glass Transition Temp. (°C)	115 ± 2	DSC - 10°C/min
Density (g/cm³)	≈1.46	
Cured glass laminate – 300 gsm Prepreg	M2 F3	NF T 16.101

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Cured Laminates Mechanical Performance

- Laminates - vacuum cured @ 90°C for 20 min., and 121°C for 120 min.

Properties	E-Glass			T700	ASTM Test Method
Fiber style	**8 Harness**	**TFX UD**	**NCS 0/90**	**12K UD**	
Fiber weight (gsm)	300	500	600	309	
Prepreg Resin Content by weight (%)	52	50	50	50	
Number of layers	12	7	6	10	
Cured laminate thickness (mm)	4.1	3.8	3.9	3.9	
Laminate FVF (%)	34.7	36.5	36.5	45.2	
Normalized thickness @ **51% FVF** (mm)	2.80	2.73	2.80	2.74	
Mechanical Values @ 25°C in	0°	0°	0°	0°	
Tensile strength (Mpa) (ksi)	300 43.5	615 89.2	346 50.2	1022 148.2	D-3039
Normalized Tensile strength (Mpa) (ksi)	440 63.8	850 123.3	480 69.6	1450 210.3	D-3039
Tensile modulus (Gpa) (msi)	21.7 3.1	41 5.9	22 3.2	117 16.9	D-3039
Flexural strength (Mpa) (ksi)	457 66.3	658 95.4	447 64.8	1093 158.5	D-790
Normalized Flexural strength (Mpa) (ksi)	667 96.7	910 131.9	620 89.9	1575 228.4	D-790
Flexural modulus (Gpa) (msi)	20.3 2.9	40.1 5.8	20.5 3.0	122 17.7	D-790
Inter-laminar Shear Strength (Mpa) (ksi)	46 6.7	60 8.7	45 6.5	68 9.9	D-2344

Toxicity Performance as per FAR 25.853

	Toxicity (concentration in ppm @ 4 minutes)						
	CO	NO / NO_2	HCN	HCl	HF	SO_2	HBr
FAA requirements▪	*< 1000*	*< 100*	*< 150*	*< 150*	*< 100*	*< 100*	-
F64-A1	380* / 230**	0.8* / 0.5**	5* / 3**	0	0	0	0
Comment	Pass	Pass	Pass	Pass	Pass	Pass	Pass

* With pilot flame / ** without pilot flame　　▪ For Airbus – AITM 3.0005, and Boeing – BSS 7239

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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.

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