

TECHNICAL DATASHEET

Toughened Epoxy 60°C Cure Component Pre-Preg

Composite Materials E60 is a proven high performance material based upon a low temperature curing modified epoxy resin matrix specifically designed for manufacture of low temperature composite components.

This particular resin system exhibits controlled resin flow and high elongation characteristics permitting direct lamination to honeycomb without the use of additional adhesives. Solid laminates can also be produced which when cured offer excellent mechanical characteristics.

The cure temperature allows high quality composite components to be produced directly from a suitable surface such as CML 650, 671, 678 tooling board or VCTP tooling pre-preg.

The flexibility, tack and handling characteristics of this pre-preg have been set so that optimum drapability is achieved allowing complex components to be easily produced

Additional Benefits:

- Out life 6-7 days at room temperature (20°C)
- Pre-preg storage life greater than 6 months at -18°C
- Good retention of mechanical properties up to 120°C
- Good impact resistance
- Low pre-preg volatile content <1%
- Uniform resin distribution through the reinforcement
- Rapid cure at medium temperature range
- Low initial cure
- Full range of woven, uni-directional, NCF, materials in carbon, glass, aramid, hybrids and specialist fibres
- Tg up to 150°C

Applications: Manufacture of composite components in a wide range of market sectors such as Motor sport, automotive, aerospace, defence, leisure, marine and telecommunications.

Processing Methods: Autoclave, vacuum bag and press moulding.

The following procedure is one frequently used in preparing autoclave or vacuum bag cured laminates

Instructions for Use:

Pre-preg should be removed from the freezer and allowed to reach room temperature prior to opening the sealed bag. The presence of moisture within the curing laminate may degrade the quality and aesthetic appearance of the structure produced. Consequently it is prudent to ensure that pre-preg of all types is thawed to the core of the roll before opening the sealed bag to avoid moisture contamination as a result of condensation. The typical thawing time for a 25Lm roll of pre-preg is 6 hours.

- Materials should be cut prior to removal of the polythene interleave and layed-up in accordance with the design instructions.
- Ensure a suitable release agent has been used such as Marbocote[®] 220 before applying the material to the tool surface.
- Care should be taken to make sure the pre-preg conforms exactly to the tool surface particularly around internal corners.

- Insert a thermocouple into the lay-up near the centre ply of the thickest edge section, outside the net trim line.
- Cleanliness is important during the lay-up procedure. Avoid introducing any contaminants into the lay-up i.e. interleave or release film as these will adversely affect the properties of the laminate and in extreme cases may lead to failure of the laminate.
- The lay-up should be de-bulked at regular intervals as detailed in the de-bulk cycle below.

De-bulk cycle:

- Cover the lay up with a suitable perforated release film such as CML/RF20RP3, ensure no bridging.
- Use two thin layers of breather over the release film.
- Apply vacuum bag and pull a minimum 840-940mbar of vacuum and hold for a minimum of 30 minutes.
- Remove vacuum bag and breather materials and set to one side for future use if required.

Once the lay up is completed, the laminate can be prepared for cure.

- Cover the laminate with a release film such as CML/RF20R or if required a perforated release film such as CML/RF20RP3.
- Apply a suitable breather material such as CML/B34075.
- Apply vacuum bag and insert at least two vacuum ports through the bag, connecting one to the vacuum source and the other, at the part furthest from the source, to a calibrated vacuum gauge
- Check all vacuum lines, connections and one way connectors for leaks. The complete system must be leak free prior to testing, and capable of achieving a vacuum of 940mbar
- Test the vacuum to ensure a leak rate not greater than 65mbar per 10 minutes and preferably 0.

Recommended Cure procedure:

- With full vacuum applied (minimum of 880-940 mbar)
- Apply the desired positive pressure if an autoclave is being used.
- Increase the autoclave temperature to 120°C at a heat up rate of 2°C/min
- When the thermocouple on the lay up reads the same as the final cure temperature allow a dwell for a specified time as shown in the chart below.
- Allow to cool to 60°C under pressure. When fully cooled the laminate maybe removed from the autoclave and debagged, trimmed and machined as necessary.
- A post cure is not required.

In certain circumstances, such as the production of thick section laminates over 10mm rapid heat up rates or highly insulating materials, CML's E120 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 of 1 hour at 80°C is recommended in order to minimize the risk.

Cure Schedules:

Temperature °C	Dwell Time (hrs)
120	0.3
100	0.5
80	1.25
70	3.5
60	8
50	18

Typical Mechanical Properties – Tooling Laminates:

Laminates were prepared using E60-C280-T4-1250 at 0°/90° configuration cured at 70°C for 3.5 hours.

Flexural Strength (MPa)	22°C	886
	125°C	501
Flexural Modulus (GPa)	22°C	48
	125°C	44
Interlaminar Shear Strength (MPa)	22°C	40
Tg (°C)	22°C	86°C
	After post cure	148°C

Availability:

CML E60 resin system is available with a wide range of reinforcements and unidirectional tapes including glass, carbon, aramid, hybrid and specialty fibres.

A list of standard fabric reinforcements available with E60 resin system are detailed below.

Designation	Description	Dry Fabric Wgt (g/m ²)	Nominal Moulded Thickness (mm)	Fibre Type
C200-T2	2/2 Twill carbon fabric	200	0.20	High strength carbon fibre
C280-T2	2/2 Twill carbon fabric	280	0.25	High strength carbon fibre
C300-T2	2/2 Twill carbon fabric	300	0.28	High strength carbon fibre
C400-T2	2/2 Twill carbon fabric	400	0.38	High strength carbon fibre
C600-T2	2/2 Twill carbon fabric	600	0.60	High strength carbon fibre
C650-T2	2/2 Twill carbon fabric	650	0.63	High strength carbon fibre
C300-B45	+/- 45° carbon NCF	300	0.25	High strength carbon fibre
C400-B45	+/- 45° carbon NCF	400	0.30	High strength carbon fibre
C600-B45	+/- 45° carbon NCF	600	0.50	High strength carbon fibre
C1200-B45	+/- 45° carbon NCF	1200	1.10	High strength carbon fibre
G202-T2	2/2 Twill glass fabric	202	0.18	E Glass continuous filament
G300-H8	8 End satin glass fabric	300	0.25	E Glass continuous filament
G600-T2	2/2 Twill glass fabric	600	0.45	E Glass continuous filament

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Storage & Outlife:

Moisture in pre-preg can have an adverse effect on the void content of the laminate. It is extremely important to fully defrost the material prior to use. CML's E60 component pre-preg should be stored at -18°C in sealed polythene bags. On removal from cold storage always allow the material to reach room temperature before breaking the seal on the bags. This will take at least 6 hours for a full roll.

Storage at -18°C is greater than 6 months.

Health and safety information:

Refer to the material safety data sheet available upon request.

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