Technical Datasheet

# EG160

## High Temp Epoxy Tooling Gelcoat

## Description

EG160 is a specialist brush-applied epoxy tooling gelcoat suitable for high temperature use up to 160°C. It is recommended when hand laminating tools/moulds that need a high service temperature, including moulds for use with prepregs such as XPREG® XC110.

## Key Features

- High temperature use up to 160°C
- Suitable for prepreg tooling
- Highly polishable
- Superior surface finish
- Simple brush application

### Typical Uses

- Gelcoat on moulds for prepreg manufacture (see service temperature notes above)
- Gelcoat on moulds for high temperature epoxy infusion
- Gelcoat on high service temperature epoxy components

## Specification

| Property | Units | Resin | Hardener | Combined |
|---|---|---|---|---|
| Material | - | Epoxy Resin | Formulated Amine | Epoxy |
| Appearance | - | Grey Paste | Amber Liquid | Grey Paste |
| Viscosity @ 25°C | mPa.s. | Paste | 100 - 160 | Paste |
| Density @ 25°C | g/cm³ | 1.13 - 1.18 | 0.92 - 0.97 | 1.08 - 1.13 |

### Tooling/Moulds for XPREG® Prepregs

EG160 is ideally suited as the surface layer on composite moulds intended for use with the XPREG range of prepregs. Moulds can be made by hand-layup (using either EMP160 paste or EL160 laminating resin and suitable reinforcement) and will be dimensionally stable and reliable at the optimum cure temperature of 120°C for most XPREG® prepregs.

A compatible high temperature release agent, should always be used.

### Maximum Service Temperatures

Any air voids present within the laminate can cause blisters or imperfections on the surface of a mould or component once it is post-cured at elevated temperature.

For this reason it is very important to minimise void content as far as possible during lamination and to limit the maximum service temperature to 120°C for moulds or components that have been laminated without any vacuum consolidation (by vacuum bag or resin infusion).

If service temperatures in excess of 125°C (up to a maximum of 160°C) are required, it is likely that vacuum consolidation - either by vacuum bagging after hand laminating or by resin infusion of the reinforcement - will be required.

These processes will ensure the negligeable void-content required to avoid the risk of blistering or delamination at the highest service temperatures.

### Effect of Gelcoats on Flat Moulds at Temperature

It should be noted that the use of *any* gelcoat (including EG160) on moulds intended for high temperature use will introduce a certain amount of 'imbalance' to the laminate, whereby the unreinforced gelcoat will have a slightly different CTE (coefficient of thermal expansion) than the reinforced backing.

Although often not noticeable on many mould geometries, this effect can result in noticeable temperature distortion on particularly large or flat moulds. In such cases, it is often preferable to forgo a gelcoat altogether.

### Compatibility Information

Backing up EG160:

EG160 can only be backed-up using a compatible epoxy-based system such as further layers of EG160 gelcoat, EMP160 epoxy paste or EL160 epoxy laminating resin. Compatibility with other high temperature epoxy resins is possible but not guaranteed.

In all cases, resins or pastes used to back-up EG160 gelcoat must have similar high temperature properties in order to result in a completed mould or component which maintains the high temperature stability of EG160.

Using cured EG160 moulds:

Moulds/tools made using EG160 gelcoat can be used to produce parts using epoxy, polyester and vinylester resin systems, including prepregs (subject to maximum service temperature). A suitable release agent is required.

# How to Use

## Mould Preparation

Patterns or moulds should be prepared with an appropriate release agent according to the manufacturer's instructions. Easy Composites' CR1 Easy-Lease Chemical Release Agent is recommended. Porous surfaces (such as MDF or tooling board) should be well sealed beforehand using S120 Tool Sealer or similar.

## Mixing

**Mix Ratio 100:25 by Weight**

EG160 gelcoat should be mixed with EG160 hardener at a ratio of 100 parts resin to 25 parts hardener, by weight. Use digital scales and be as accurate as possible.

Thoroughly mix the gelcoat and hardener being careful to avoid air entrapment and ensure that all resin and hardener from the bottom and sides of the container have been properly combined.

Mixed EG160 gelcoat will produce significant heat when curing. Mix in small batches and use expediently.

## Application

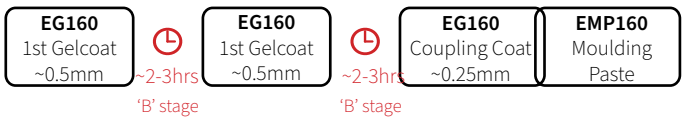
EG160 should be applied onto the pattern or mould in two even layers of approximately 0.5mm per layer. The second gelcoat layer as well as the main reinforcement application must be made whilst the previous gelcoat application is still in its 'b-stage' which means that it is firm but still tacky. The gelcoat must not be allowed to cure past this point without the next layer having been added otherwise delamination (especially at elevated temperature) is likely.

The two layers of gelcoat should be backed-up using EMP160 High Temp Epoxy Moulding Paste or EL160 High Temp Epoxy Laminating Resin with suitable reinforcement.

**Backing-up with EL160 High Temp Laminating Resin**


**Backing -up with EMP160 High Temp Moulding Paste**

When backing up with EMP160 moulding paste, a third thin layer of EG160 should be used to 'couple' the paste (wet-on-wet) to the first gelcoat layers:




See also: "Easy Composites Process Guide - Producing High Temperature Composite Tools by Hand Layup".

## Pot-Life / Working Time / Cure Time

EG160 is a reactive resin system and once the resin has been mixed with the hardener, the reaction will start to give off heat (exotherm) which will further accelerate the cure of the resin, especially when the resin is in the mixing pot.

Transfer the resin from the mixing pot onto the part as soon as possible to extend the working time and avoid the risk of uncontrollable rapid cure in the mixing pot.

As with all epoxies, the pot-life/working time will vary significantly depending on the ambient temperature, the starting temperature of the resin and hardener and the amount of resin mixed.

EG160 can be used in ambient temperatures between 15°C (59°F) and 30°C (86°F). For best results, an ambient temperature of at least 20°C (68°F) is recommended. Ensure that both resin and hardener containers are within this temperature range before use.

The table below gives an indication of pot-life and cure properties:

| Pot Life @ 25 °C | Gelation @ 25 °C | Demould @ 25 °C |
|---|---|---|
| 50 - 70 mins | 2 - 3 hours | 24 hours |

## Full Cure and Post-Cure

Before components or moulds made using EG160 gelcoat can be used at elevated temperature, they must be allowed to cure for a minimum of 24hrs at room temperature and then undergo a ramped (or stepped) post-cure to at least 5°C above the required service temperature.

The EG160 can be cured to a demouldable state in 24hrs at 25°C, but at this stage, it can be brittle and prone to cracking during demoulding of more complex mould shapes. Therefore, in most cases, it is recommended to conduct the initial cure at 40°C (whereby the cure time can be reduced to 12hrs). Conducting the initial cure at 40°C is low enough to avoid distortion of the pattern whilst still curing the resin to an adequately non-brittle state to demould without risk of damage.

**Recommended:** 12hrs @ 40°C

**Alternative:** 24hrs (min) @ 25°C - Warning: Resin will be very brittle before post-cure

To minimise the risk of distortion, an initial cure should be undertaken still on the mould (or pattern). This is to allow the resin system to cure enough to ensure that, during the main post-cure, the mould will not deform or distort as the temperature rises.

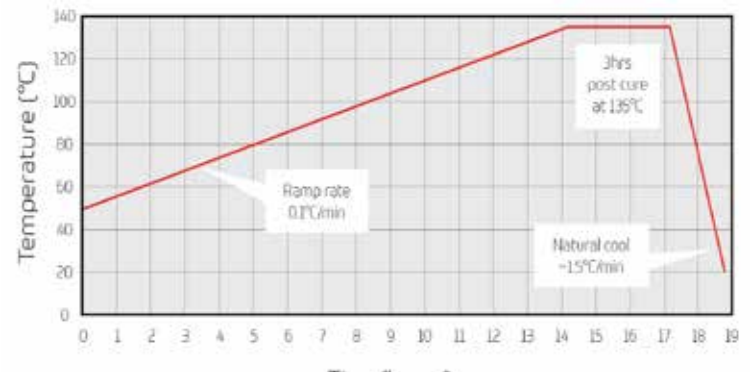
Once the initial cure is complete, the piece can then be demoulded ready for the full post-cure.

Suggested Post-Cure Cycle for Prepreg Tools

After initial cure, the new mould should be removed from the pattern and then post-cured - using a very gradual ramp rate to avoid distortion - up to its full service temperature.

| Step | Start Temp | Ramp Rate | Duration (hrs:mins) | End Temp | Elapsed Time |
|---|---|---|---|---|---|
| 1 | 50 °C | 0.1 °C/min | 14:10 | 135 °C | 14:10 |
| 2 | 135 °C | Soak | 3:00 | 135 °C | 17:10 |
| 3 | 135 °C | Natural Cool | 0:45 | ~20 °C | 18:55 |

The recommended post-cure cycle (above) calls for a temperature ramp from 50°C to 135°C. If a temperature controller with programmable ramp rate is not available then the oven temperature can be increased by 12°C every 2hours until 135°C is reached.




## Mechanical Properties

The table below gives an indication of Cured Resin Properties:

| Property | Unit | Test Method | Value |
|---|---|---|---|
| Hardness | Shore D | ISO 868 | 80 - 85 |
| Tensile Strength | MPa | ISO 527 | 23 - 28 |
| Tensile Modulus | MPa | ISO 527 | 1600 - 2000 |
| Flexural Strength | MPa | ISO 178 | 60 - 65 |
| Flexural Modulus | MPa | ISO 178 | 2300 - 2800 |
| Elongation at Break | % | ISO 527 | 1.0 - 2.0 |
| Heat Distortion Temp. | °C | TMA | 150 - 160 |

## Transport and Storage

Resin and hardener should be kept in tightly seal containers during transport and storage. Both the resin and hardener should be stored in ambient conditions of between 10°C (50°F) and 25°C (77°F).

When stored correctly, the resin and hardener will have a shelf-life of 12 months. Although it may be possible to use the resin after a longer period, a deterioration in the performance of the resin will occur, especially in relation to clarity and cure profile.

Pay particular attention to ensuring that containers are kept tightly sealed. Epoxy hardeners especially will deteriorate quickly when exposed to air.

## Disclaimer





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