

Kit Description

This special high temperature version of our epoxy mould making kit can be used to produce composite moulds suitable for use at service temperatures up to 160°C, making it ideal for the production of small moulds for use curing prepregs and other materials that require a heated cure. The kit uses a highly polishable epoxy gelcoat, and easy-to-use laminating 'paste' for the main reinforcement.

The fibrous laminating paste used for the main reinforcement is effective in helping to avoid the blistering and voiding that are normally associated when high temperature moulds are laminated by hand.

The materials in the kit are sufficient to produce a mould of approximately 40cm x 40cm, depending on the depth and shape of the mould. Slightly larger moulds can be made by reducing the thickness of the main reinforcement, but this will result in a less robust mould.

There is no requirement to use all the materials in one go which allows for multiple, smaller moulds to be produced.

Kit Contents

- 250g EG160 High Temperature Epoxy Tooling Gelcoat
- 1.08kg EMP160 High Temperature Epoxy Laminating Paste
- 50ml CR1 Easy-Lease Chemical Release Agent (plus Lint-Free Wipe)
- 297x200mm Fluted Signboard (2 sheets)
- 10g Filleting Wax
- 3x 1" Laminating Brushes
- Mixing Cups, Sticks and Nitrile Gloves

Maximum Use Temperature

Theoretically, the maximum service temperature of the EG160/EMP160 system is 160°C, however, hand-laminated moulds are always at risk of blisters when first used at high temperature due to the possibility of air entrapment within the reinforcement, or between the gelcoat and reinforcement. Therefore, for hand-laminated moulds that are not vacuum bagged, the maximum recommended service temperature should be limited to 125°C.

Due to the increased risk of blistering at higher temperatures, it is recommended to only post-cure your mould to 10°C above the temperature required for the process the mould will be used for. For example, if the mould will be used to allow a rapid cure of an infusion resin at 70°C, the mould should only be post-cured to 80°C. Doing so will avoid the unnecessary risk of a higher temperature post-cure.

Post Curing

In common with almost all high-temperature tooling systems, moulds made using the materials in this kit require post-curing at elevated temperatures before they can be put into service as a high temperature mould. This involves curing the mould at room temperature for 24hrs, before removing the mould from the part or pattern, and then post-curing the mould by gradually increasing the temperature to 10°C above the required service temperature.

In a computer-controlled oven (such as our OV301), this gradual increase in temperature can be easily achieved by setting a controlled 'ramp rate' on the cure cycle. In the case of a domestic oven, or industrial oven with basic temperature control, this gradual increase in temperature can be achieved by incrementally increasing the temperature over time.

Step By Step Guide

This example project demonstrates how to take make a moulding from a cosmetic vehicle vent made from plastic. The mould is then used to make a duplicate of the vent using high tech prepreg carbon fibre, all thanks to the high temperature materials in this kit.

1. Preparing the Pattern



The first step is to add barriers around the perimeter of the shape using a sheet of fluted signboard, when working with prepregs, these flanges can be fairly narrow (around 30mm) but for other laminating methods you may want to increase their size. Once

templated and cut out, they can be securely attached to the pattern with hot melt glue.

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2. Release agent

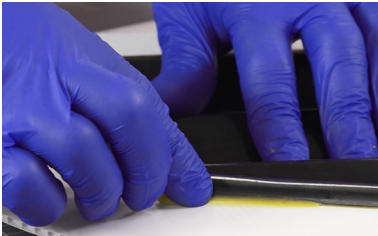
This kit is all about high temperature use therefore a high temperature release agent is required. CR1 is a semi-permanent chemical release agent that is capable of being used at elevated temperature.



CR1 should be methodically wiped over the surface of the part and the barriers with a lint free wipe, ensuring that the entire face is coated. This should be then left to cure for 15 minutes and repeated for a total of 6 coats, using a fresh piece of cloth for each coat will

ensure that the surface isn't contaminated with old release agent. Once the final layer has been applied, the CR1 should be left for an hour to fully cure before moving onto the next step.

**CR1 is a solvent based products and may attack some plastics, testing in a small discreet area first is always recommended*



Any gaps between pattern and signboard can be filled with the yellow filleting wax and smoothed out to make a seamless join and prevent any gelcoat from seeping between the two.

Before You Begin - Timing Is Critical!

For the application of the EG160 gelcoat and EMP160 paste, correct timing is critical.

Take the time to familiarise yourself with the correct timing intervals for the application of the gelcoat and paste, and ensure that you have sufficient time to complete the process before you begin.

In order to ensure a correctly bonded mould, the gelcoat and paste must be applied according to the following schedule:

EG160 1st Gelcoat 0.5mm	 ~2-3hrs	EG160 2nd Gelcoat 0.5mm	 ~2-3hrs	EG160 Coupling Coat 0.25mm	EMP160 Moulding Paste 10mm
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1. Apply first layer of EG160 gelcoat
2. Wait 2-3hrs until the gelcoat reaches the 'B-stage' (firm but tacky)
3. Apply second layer of EG160 gelcoat
4. Wait 2-3 hours until the gelcoat reaches the 'B-stage'
5. Apply a third, thin 'coupling coat' of EG160 gelcoat
6. Apply the EMP160 paste onto the wet 'coupling coat'

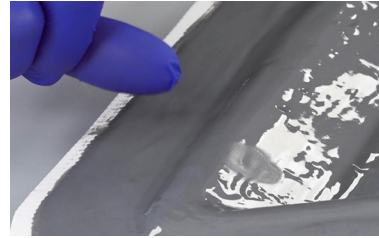
This means you should ensure that you have 5-7 hours available to complete the layout, before you begin.

3. Tooling Gelcoat

EG160 gelcoat is applied in two coats to produce a hard polishable surface to the mould. The gelcoat and hardener should be accurately weighed out using digital scales, as per the mix ratio on the containers. The two parts can then be thoroughly mixed, paying particular attention to the sides and bottom of the mixing cup.



The gelcoat can then be brushed over the surface of the pattern at a thickness of around 0.5mm, try and aim for an even coverage and reduce pooling where possible.



The first gelcoat application should now be left for around 2-3 hours to cure to the 'B' stage, at this point the gel will still be tacky but firm enough that it leaves no residue to a gloved finger when pressed onto the surface.

The second coat is weighed, mixed, applied and left to cure to the 'B' stage in exactly the same way as the first.

4. Coupling Coat and Laminating Paste Reinforcement

To give a really good bond to the gel coat and the reinforcement backing a coupling coat can be made from a small batch of EG160 and brushed in a thin layer of the part. As this layer does not need to cure the EMP160 paste can be applied immediately.



EMP160 & hardener then need to be weighed out and mixed and kneaded for round 2-3 minutes to ensure that the 2 parts are fully combined into a dough like material with consistent texture.

The paste can then be spread out to form a sheet around 10mm thick and divided up into smaller pieces.



These pieces can then be applied to the mould on top of the wet coupling coat. Care must be taken at this stage to ensure no air pockets are trapped between paste and gel or in the paste itself.

Once the entire part is covered the paste can be neatened up to reduce any loose fibres and left to cure for at least 24 hours at room temperature.

5. Demoulding & Trimming



Once the initial room temperature cure is complete and the paste has fully hardened, the mould barriers and the original can be removed.

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The mould can then be trimmed and tidied up with an abrasive. Any remaining wax residue needs to also be removed at this point.

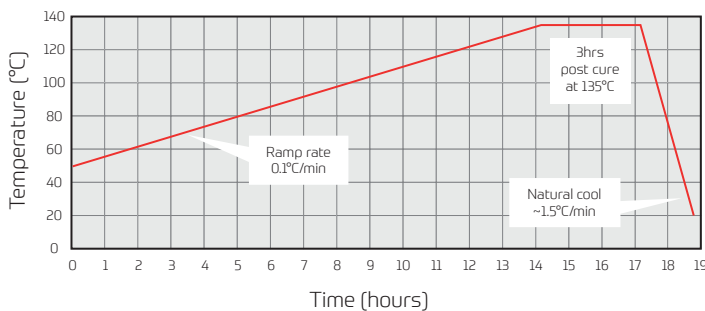
6. Post Cure



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

To minimise the risk of distortion, the initial cure should be undertaken still on the mould (or pattern). This needs to be for a minimum of 24 hours at room temperature (20°C) before you can safely demould the component or mould. 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.

Suggested Post-Cure Cycle for Prepreg Tools



After initial cure, the new mould should be heated - 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	00:45	~20°C	18:55

Post Curing in a Non-Programmable Oven

The recommended post-cure cycle (above) calls for a controlled 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 2 hours until 135°C is reached where the mould will need to sit for 3 hours.

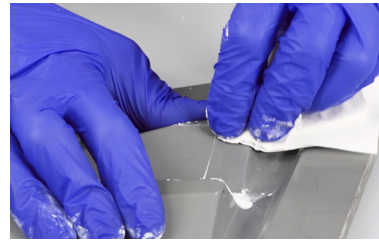
For a thermostatically controlled oven we recommend using a thermometer to check the internal temperature of the oven as there is often a discrepancy between the set temperature and the actual recorded temperature.

7. Mould Preparation

Once the mould has cooled from the oven it can be prepared with release agent, much in the same way that the part was treated prior to making the mould. 6 layers of Easy-Lease CR1 applied with a fresh cloth per coating and allowed to cure for 15 minutes between applications.

Once the final layer has cured for at least an hour, the mould is ready for service.

Mould Repair



Occasionally moulds can become damaged, or can even have small defects caused by voids or trapped air when being made in the first instance. If you do find this is the case then you may need to undertake a repair to the mould surface.



This is easily done by preparing the area with a good key and then adding a small quantity of EG160 tooling gel. Once cured this can be sanded and polished to blend back into the surface of the mould.

Remember, if mould has already been post cured you will need to repeat the process to condition any additional resin used for the repair.

Disclaimer

This data is not to be used for specifications. Values listed are for typical properties and should not be considered minimum or maximum.

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