EL160 HIGH TEMPERATURE

EPOXY LAMINATING RESIN

Key Features

- High Heat Distortion Temperature
- Medium Viscosity Resin
- Excellent Wetting Abilities
- Good Mechanical Properties
- Long Pot Life

Product Description

EL160 is a high performance epoxy laminating resin designed for use at service temperatures up to 170°C. The resin is compatible with a wide range of reinforcement materials including glass fibre (typically for mould making) and high performance fibres such as carbon fibre and aramid (e.g. Kevlar®). The cured mechanical properties of EL160 are outstanding.

EL160 is ideally suited to the production by hand layup of high temperature components and high temperature moulds (including prepreg moulds - see High Temperature Epoxy Tooling Guide.

As well as its high HDT, this epoxy system also has good clarity, a low viscosity and exceptional wetting characteristics when used with glass, carbon or aramid fibre.

Recommended Uses

The resin is suitable for use in wet-lay laminating or vacuum bagging of composite parts, R.I.M. Tooling, vacuum forming and other applications requiring dimensional stability at high temperatures (HDT). Applications include uses such as exhaust heat shields, engine bay components and use in casting and injection tooling.

Starter Kit Compatibility

This is the resin used in the high-temperature version of our carbon fibre laminating starter kit.

Properties

The table below shows the typical uncured properties:

Property	Units	Resin	Hardener	Combined
Material	-	Epoxy Resin	Amine	Epoxy
Appearance	-	Amber Liquid	Clear Liquid	Amber Liquid
Viscosity @25 °C	mPa.s.	1000 – 1500	55 - 75	450 – 650
Density @25 °C	g/cm^3	1.08 – 1.18	1.07 – 1.13	1.12 – 1.18

How to Use

Our EL160 High Temperature Epoxy Lmainating Resin is a chemical product for professional use. It is essential to read and understand the safety and technical information before use.

Follow the guidelines for safe use outlined in the SDS which include the use ofappropriate hand and eye protection during mixing and use.

Health & Safety Precautions

Wear respiratory protection when cutting or machining

- Always work in a well ventilated environment
- Wear gloves, safety glasses and waterproof clothes

For further information, consult the product safety data sheet.

Mix Ratio

Mix Ratio 100:35 by Weight

EL160 High Temperature Epoxy Laminating Resin should be mixed with its Hardener at a ratio of 100 parts of resin to 35 parts of hardener, by weight.

You must maintain the correct overall ratio of resin to hardener to ensure a proper cure. Failure to do so will result in a poor or only partial cure of the resin, greatly reduced mechanical properties and possibly other adverse effects. Under no circumstances add 'extra hardener' in an attempt to speed up the cure time; epoxies do not work in this way.

Mixing Instructions

Only weigh out and mix as much resin as you can use within the pot life. Weigh or measure the exact correct ratio of resin and hardener into a straight sided container. Using a suitable mixing stick begin to mix the resin and hardener together to combine them completely.

Spend at least one minute mixing the resin and hardener together, paying particular attention to the sides and base of the container. Remember: Any resin that has not been thoroughly combined with hardener will not cure.

Once you have finished mixing in one container, it is good practice to transfer the mixed resin into a second container and undertake further mixing of the resin using a new mixing stick. Doing so will eliminate the risk of accidentally using unmixed resin from the bottom or sides of the container.

Pot-Life / Working Time / Cure Time

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.

Our EL160 High Temperature Epoxy Laminating Resin 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.

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

Pot-Life @ 25 °C	Gelation @ 25 °C	Cure Time @ 25 °C	Full Cure @ 25 °C
5 - 6 Hours	10 - 14 Hours	24 Hours	7 Days

Full Cure / Post-Cure

As with most epoxy systems, where parts cure in normal ambient temperatures, full cure is not reached for several days. Although parts will be handleable after the listed demould time (at 25°C), full mechanical properties will take at least 14 days to develop in (at 25°C). Where possible, avoid exposing the cured resin to full service rigours for at least this time. To achieve high Heat Distortion Temperatures up to 170°C, you will need to conduct a post-cure of the finished part.

Where possible, parts should be post-cured still inside the mould to reduce distortion and improve surface finish (i.e. reduce 'print-through'). When post-curing parts in the mould, it is important to post-cure them without demoulding at all (i.e. don't demould and then put them back into the mould) otherwise you can get some strange patterns on the surface where some areas are post cured in direct contact with the mould surface and others are not.

- 24hrs at room temperature
- 1hr at 40°C
- 1hr at 60°C
- 1hr at 80°C
- 1hr at 100°C
- 1hr at 120°C
- 2hrs at 140°C
- 2hrs at 160°C

Then allow to cool fully before demoulding and use. When post-curing is complete, let the unit cool down slowly to room temperature, preferably in the oven.

Mechanical Properties

Cured Resin Properties

	Standard	Units	Result
Colour			Pale yellow
Density 25°C	BS 2782: Part3: Method 620	g/ml	1.10
Hardness 25°C	BS 2782: Part 3: Method 365B	Shore D	85 - 88
Maximum Tg	TMA	°C	170
Flexural strength	BS 2782: Part 3: Method 335A	MPa	62 - 67
Flexural modulus	BS 2782: Part 3: Method 335A	MPa	2600 - 3000
Tensile strength	BS 2782: Part 3: Method 320B	MPa	20 - 25
Elongation at break	BS 2782: Part 3: Method 320B	%	1.0 - 2.0

Using EL160 to create High Temp. Moulds

Our EL160 can be used with the EG160 High Temp Epoxy Tooling Gelcoat, the EMP160 Epoxy Moulding Paste and a appropriate glass or carbon fabric to produce high quality high temperature stable moulds for use with out of autoclave pre-pregs and where you need a high temperature tool for use up to 125°C. When Using EL160 in this way, you must follow a different post cure cycle to the standard one for the resin. This is to ensure the mould does not distort or warp during the process.

The new tool 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.

To minimise the risk of distortion, an 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.

Once the initial room temperature 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	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	45:00	~20°C	18:40

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.

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

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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