

Product Description

LTM20 is a prepreg system specifically designed for the manufacture of prototype components and structures. The low temperature cure characteristics make this system ideal for moulding highly accurate components directly from tooling block and other prototype tooling media.

Features

- Low initial cure temperature 20°C – 30°C.
- Ability to cure rapidly at temperatures up to 70°C.
- Ultimate Tg after suitable postcure 130°C.
- Good handleability.
- Good mechanical performance.
- Outlife of 12-16 hours at 20°C.
- Can be built up to any thickness by staged lay up techniques.
- Releases well from Polyurethane master model block.
- Good surface finish and low void contents achievable with vacuum bag only moulding.
- Excellent surface finish from autoclave cures.
- Twelve week freezer storage life.
- Available on a range of reinforcement types.
- Made by a solvent free process – no residual volatiles.

Instructions For Use

Prepreg should be removed from the freezer and allowed to reach room temperature prior to opening the sealed bag. The presence of moisture within a curing laminate may degrade the quality and aesthetic appearance of the structure produced. The level of degradation will vary and depend to a large extent on the specific processing route selected. Consequently it is prudent to ensure that prepreg of all types is thawed to the core of the roll before opening the sealed bag to avoid potential moisture contamination as a result of condensation. For a 25m roll of prepreg, a typical thaw time is of the order of 6 hours, therefore it may be advantageous to order roll lengths or cut pieces to suit each particular application.

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Prepreg should be cut prior to removal of the release films. (The balance of prepreg not required should be resealed and returned to the freezer although it is preferable to cut up complete rolls on first removal from the freezer and store required amounts in separate packs).

The release paper should be removed from the first ply, which should then be positioned into the carefully released mould. Great care should be taken to ensure that the prepreg conforms **exactly** to the tool shape, especially around female corners to ensure consolidation without bridging. Rollers and shaped PTFE spatulas may be used to assist this operation. The top release film should be removed once the prepreg has been positioned. Subsequent layers may then be applied in the same manner until the desired thickness is achieved.

The lay up should be vacuum debulked at regular intervals with 880-948mbar (26-28in Hg) of vacuum for 10-20 minutes, covering the laid up material with perforated release film (P3) plus a suitable breather. A low cost membrane may then be sealed into position to complete the vacuum bag.

On large components, which may take several days to prepare, the worklife of the laid up LTM20 prepreg may be exceeded prior to elevated temperature cure. In such cases please refer to ACG Technical Department for specific advice if this is likely.

It is recommended that Halar products are not used for the final bagging operation. This is because they tend to adhere to the cured laminate. Polyethylene or Polypropylene based release films are recommended for use with this material. Consult Advanced Composite Group's Technical Department for further information.

Final bagging process should include the following materials:-

- Polyethylene or Polypropylene release film
 - Autoclave cure:- solid film recommended
 - Vacuum bag cure:- Pinpricked/P3 film recommended
- Breather
 - Autoclave cure:- 10oz breather
 - Vacuum bag:- 10oz or 4oz breather as required

Note: Cut release film and breather layers and tailor to conform to the shape of the tool. Ensure that there is no bridging of the consumable materials.

- Low temperature capable vacuum membrane
- Low temperature capable sealant tape

Initial Cure

LTM20 prepreg may be processed by vacuum or autoclave techniques. Cure can be carried out at any temperature from ambient to around 70°C, and it is therefore essential for the end user to carefully consider all aspects of their own particular requirements. ACG recommends that suitable tests are carried out to ensure that the proposed cure cycle is satisfactory before committing to a full-scale lay up.

General recommendations for the time/temperature conditions to be applied during cure of LTM20 are summarised in the following table:-

Initial Cure Temperature	Optimum Cure Time	Minimum Cure Time
20°C	72 hours	48 hours
25°C	40 hours	32 hours
30°C	16 hours	12 hours
50°C	4 hours	3 hours
70°C	1½ hours	1 hour

Shorter cure times for specific applications (e.g. press moulding) may be considered. Please contact the Advanced Composites Group's Technical Department for further information.

Exotherm

Note: You are advised to read this section before proceeding with initial cure.

LTM20 is a reactive formulation which can undergo severe exothermic heat build up during the initial curing process if incorrect curing procedures are followed.

Great care must be taken to ensure that safe heating rates, dwell temperatures and lay-up/bagging procedures are adhered to, especially when moulding solid laminates in excess of 3-4mm thickness. The risk of exotherm increases with lay up thickness and increasing cure temperature, and it is strongly recommended that trials representative of all the relevant circumstances are carried out by the user to allow a safe cure cycle to be specified. It is also important to recognise that the model or tool material and its thermal mass, combined with the insulating effect of breather / bagging materials can affect the risk of exotherm in particular cases. Please contact Advanced Composites Group Technical Department for further information on exotherm behaviour.

Typical Cure Cycles

Vacuum / Oven cure:

Apply 26in Hg (880mbar) vacuum at room temperature.

Using the table on page 3 as a guide, select the required cure temperature and associated optimum cure time [e.g. 30 ±2°C for 16 hours].

Note: Cure temperature should be controlled by thermocouples in the air and also monitored by thermocouples attached to the component. It should be controlled as closely as possible, in accordance with the tolerances stated.

Heat to required cure temperature at up to 3°C per minute.

Maintain at required cure temperature (e.g. 30 ±2°C) under the applied vacuum for at least the time specified (e.g. 16 hours) per the table on page 3.

Remove heating and cool to room temperature slowly under vacuum.

Note: Advanced Composites Group recommends that large block masters are cooled extremely slowly (preferably with the use of an insulating blanket) to avoid the possibility of the master cracking.

Autoclave cure:

Note: Cure temperature should be controlled by thermocouples in the air and also monitored by thermocouples attached to the component. It should be controlled as closely as possible, in accordance with the tolerances stated.

Apply 26in Hg (880mbar) vacuum at room temperature. Maintain for 15 minutes.

Heat to required cure temperature e.g. 30 ±2°C at up to 3°C per minute.

Raise pressure to 0.62MPa (90psi) or the safe maximum for the core type being used.

Vacuum should be retained throughout the cure cycle.

Dwell at required cure temperature e.g. 30 ±2°C and retain the desired pressure for the optimum cure time e.g. 16 hours at 30°C.

Cool to room temperature under pressure.

Please contact Advanced Composites Group Technical Department for further advice on non-standard cures for particular applications.

Further guidance on selection of time/temperature combinations suitable for initial cure is provided in the table on page 3.

Postcure

Laminates cured for the recommended period at 30°C or higher temperatures may be used up to 45°C maximum in service without additional postcure.

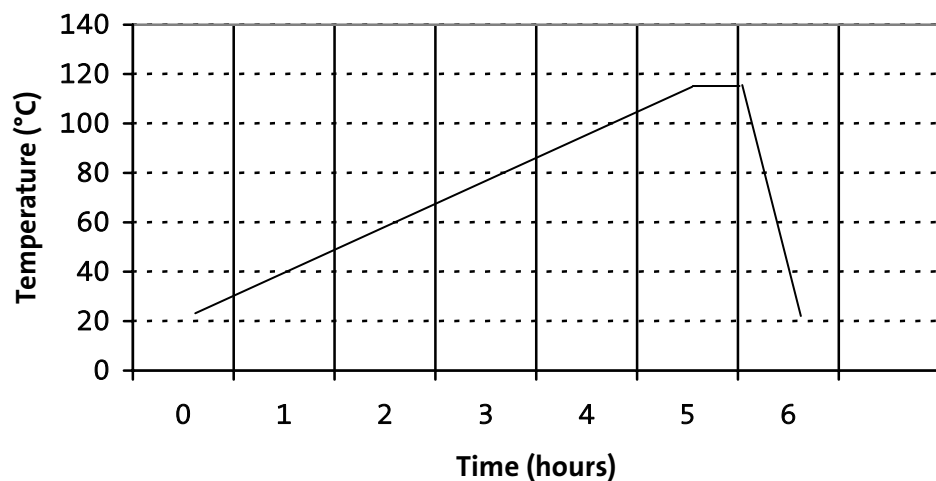
In applications demanding maximum temperature resistance e.g. 100°C it is essential to develop the glass transition temperature of the resin to the maximum level. This may be achieved by using the full recommended postcure as follows:-

Heat to 120 ±2°C at 20°C per hour maximum. Dwell for 30 mins at 120 ±2°C. Cool at 3°C per minute to RT.

This will result in a Tg of approx. 130°C.

Laminates may be postcured unsupported unless the size, shape and laminate thickness would allow excessive distortion under self-weight, in which case some minimal support is desirable.

LTM20 Single Ramp Postcure



Other postcure cycles can be used to achieve intermediate levels of cure for lower service temperatures.

Technical Data

Resin Matrix Properties:

Cured Resin Properties	Units	LTM20
Cured Resin Density (Dry)	g/cm ³	1.22
Tg after 48 hours at 20°C	°C	34
Tg after 72 hours at 20°C	°C	36
Tg after 16 hours at 30°C	°C	47
Tg after 24 hours at 30°C	°C	50
Tg after 48 hours at 30°C	°C	59
Tg after 2 hours at 50°C	°C	44
Tg after 4 hours at 50°C	°C	73
Tg after 6 hours at 50°C	°C	73

Typical Mechanical Properties:

The following table details mechanical test results for laminates produced using LTM20 resin system.

Woven Carbon laminate:

LTM20/CF0100 @ 41%RW (50 Vf%)

(CF0100 = 280gsm, 4x4 twill)

7 plies thick (2.25mm)

Cured on PTFE coated aluminium plate under vacuum bag conditions

Cure	Condition	Tg (°C)	Flexural Strength (MPa)	Flexural Modulus (GPa)	ILSS (MPa)
30°C 16 hours	RT Dry	Approx. 47	923	52	71
30°C 24 hours	RT Dry	Approx. 50	1041	53	71
30°C 48 hours	RT Dry	Approx. 59	1056	56	89
Postcured	RT Dry	Approx 130	833	49	75
Postcured	RT Wet	-	-	-	74
Postcured	100°C Dry	-	789	48	60
Postcured	100°C Wet	-	529	40	47

All flexural data normalised to 55Vf

Wet = 2hour waterboil

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All statements, technical information and recommendations contained in this data sheet are given in good faith and are based on tests believed to be reliable, but their accuracy and completeness are not guaranteed. They do not constitute an offer to any person and shall not be deemed to form the basis of any subsequent contract, nor to constitute any warranty or representation as to quality, merchantability or fitness for purpose. All products are sold subject to the seller's Standard Terms and conditions of Sale. Accordingly, the user shall determine the suitability of the products for their intended use prior to purchase and shall assume all risk and liability in connection therewith. It is the responsibility of those wishing to sell items made from or embodying the products to inform the user of the properties of the products and the purposes for which they may be suitable, together with all precautionary measures required in handling those products. The information contained herein is under constant review and liable to be modified from time to time.

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Availability

All LTM20 prepregs are available in a wide range of reinforcing fabrics including glass, carbon, aramid and hybrids.

Storage and Outlife

Resin System	LTM20
Maximum Outlife at 20°C	16 hours
Storage life at -18°C	12 weeks

All LTM20 prepregs should be stored wrapped and sealed in polythene at -18°C, in the original box on the roll end supports provided. The storage life of the prepregs under these conditions is at least 12 weeks.

Health and Safety

All LTM20 prepregs contain epoxy resin which can cause allergic reactions by skin contact. Avoid prolonged or repeated contact with skin. The use of gloves and protective clothing is advised.

Wash the skin thoroughly with soap and water or resin removing cream after handling. Do not use solvents for cleaning the skin.

Use mechanical exhaust ventilation when heat curing the resin system.

For further information consult ACG Materials Safety Data Sheet No. 229.