

Product Description

ACG's LTM26 resin series encompasses a number of low to medium viscosity epoxy matrices formulated to cure at low initial cure temperatures.

All variants in the LTM26 series can be used to manufacture components by autoclave, press or vacuum bag moulding techniques. After post-cure, these resins are suitable for service temperatures up to 115°C (239°F) dry or 90°C (194°F) wet. Variants in the LTM26 Series are:

- LTM26, which is the base resin for all Series variants, is a low viscosity epoxy prepreg.
- LTM26B is a black pigmented version of LTM26.
- LTM26EL is an extended life version of LTM26.
- LTM26ELB is a black pigmented version of LTM26EL.
- LTM26ELFR is a fire-retarded version of LTM26EL, passing JAR25.853 Vertical Burn.
- LTM26ELFRB is a black pigmented version of LTM26ELFR.
- Additionally, LTM26ELFS, a low smoke (DIN5510, M1 compliant) variant of this resin system, is also available. Refer to ACG data sheet PDS1035 for additional information.

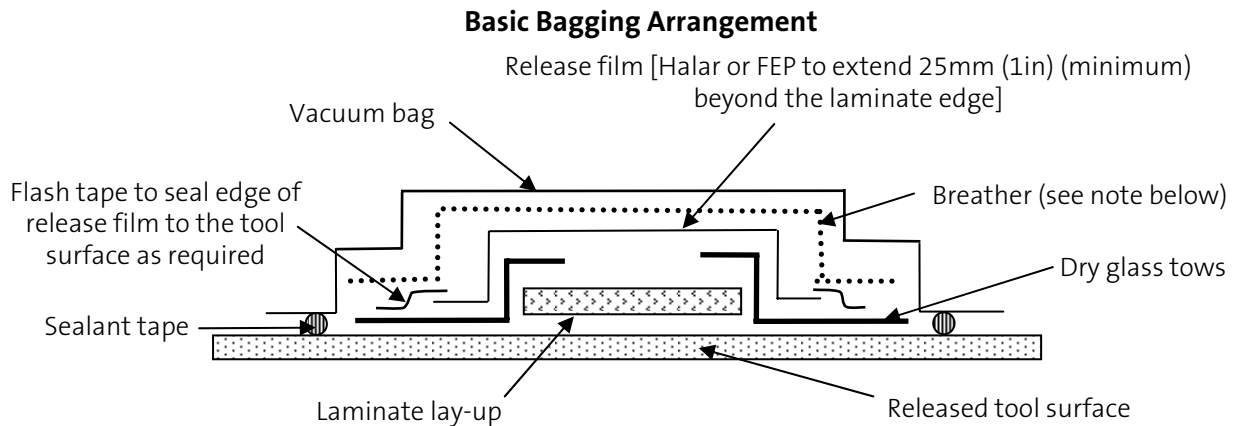
Features

- Out life between 2 and 6 days (See note under 'Out Life and Storage').
- Low initial cure temperatures between 50 and 60°C (122 and 140°F).
- Service temperatures up to 115°C (239°F) (LTM26EL).
- Excellent mechanical properties, equivalent to 120°C (248°F) curing prepreg systems.
- High quality components can be made from low cost/low temperature moulds.
- Rapid cure capability between 80 and 120°C (176 and 248°F).
- Adhesion to foam core materials.
- Available in woven and unidirectional reinforcements, including carbon, glass, aramid, and also specialist fibres and hybrids.
- Resin film variants (LTA26 and LTA26NC) available if required.

Instructions for Use

The prepreg should be removed from the freezer, thawed and allowed to reach room temperature before removal from the protective polythene bag.

Prepreg should be cut to shape and laid up in accordance with design instructions. Care must be taken to ensure the prepreg conforms exactly to the tool shape, especially around internal corners. The lay-up should be vacuum debulked at regular intervals using a P3 (pin pricked) Halar release film on the prepreg surface and a breather. Depending on prepreg format, a vacuum of 980mbar (29in Hg) should be applied for up to 30 minutes.



Glass Tows Detail

Placing dry glass tows at 0.5m (20in) intervals around the edge of the laminate will provide air paths under the release film and into the breather (depicted above).

Release Film Detail

The release film (solid or perforated) may be taped down to the tool surface with flash tape as required. However, because LTM26 resins are relatively low viscosity, some resin bleed can occur. Therefore, if a perforated release film is used, it is recommended that a trial laminate be made to determine the amount of resin removed and whether this could induce porosity in the laminate.

Breather Detail

Autoclave: One ply of heavyweight breather 340g/m² (10oz/yd²) is recommended. The breather should connect directly to the vacuum ports, where two or three additional layers of breather should be applied locally.

Vacuum Bag: One ply of lightweight breather 120g/m² (3.5oz/yd²) is recommended. The breather should connect directly to the vacuum ports, where two or three additional layers of breather should be applied locally.

The highest available vacuum, typically 980mbar (29in Hg), must be achieved. It is essential that the laminate is fully exposed to the vacuum. This should be checked by placing a gauge at the opposite side of the laminate to the position of the vacuum port.

A vacuum drop test should be performed prior to curing the part. The test must show a pressure drop of no more than 68mbar (2in Hg) within 10 minutes once the vacuum is removed.

Exotherm

LTM[®]26 Series prepregs contain reactive epoxy resins 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's technical department for advice on exotherm behaviour.

Typical Cure Cycle for ACG LTM26 Series

Vacuum/Oven Cure

- Apply vacuum at room temperature.
- Heat to 60 + 5/-0°C (140 + 9/-0°F) at 1 to 3°C (1.8 to 5.4°F)/minute maximum.
- Maintain at 60 + 5/-0°C (140 + 9/-0°F) under the applied vacuum for a minimum of 5 hours (LTM26 Series) or 8 hours (LTM26EL Series).
- Cool to room temperature slowly under vacuum.

Autoclave Cure

- Apply vacuum at room temperature and maintain for 15 minutes.
- Pressurise autoclave and start the heating cycle.
- Heat to 60 ± 2°C (140 ± 3.6°F) at 1 to 3°C (1.8 to 5.4°F)/minute maximum.
- Vent vacuum to atmosphere when pressure reaches 1.4bar (20psi).
- Maintain at 60 + 5/-0°C (140 + 9/-0°F) under the applied vacuum for a minimum of 5 hours (LTM26 Series) or 8 hours (LTM26EL Series).
- Cool to room temperature at 1°C (1.8°F)/minute maximum under pressure.

For single skin laminates the pressure range advised is 3 to 6bar (50 to 90psi). However, when curing sandwich structures, the core crush strength must be considered when selecting the pressure.

Alternative Initial Cure Cycles

Cure Temperature	Gel Times (minutes)		Cure Times (hours)			
	LTM26	LTM26EL	LTM26		LTM26EL	
			minimum	optimum	minimum	optimum
50°C (122°F)	120	450	10	12	16	20
55°C (131°F)	85	300	7	9	12	14
60°C (140°F)	60	200	5	6	8	10
65°C (149°F)	45	135	3	4	6	8
70°C (158°F)	30	90	2.5	3	4	5
80°C (176°F)	15	44	1.5	2	2	3
90°C (194°F)	10	22	0.75	1	0.75	1
100°C (212°F)	6	11	0.5	0.5	0.5	0.5

Post-Cure

Laminates cured for the recommended period at 60°C (140°F) may be used up to 60°C (140°F) (maximum) in service without additional post-cure.

In applications demanding maximum temperature resistance under load, 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 post-cure as follows:

- Heat from room temperature to 120 ± 5°C (248 ± 9°F) at 1°C (1.8°F)/minute (maximum).
- Dwell for 1 hour at 120 ± 5°C (248 ± 9°F).
- Cool to room temperature at 3°C (5.4°F)/minute.

For this post-cure to be effective the ramp rate of 1°C (1.8°F)/minute must not be exceeded. Alternative stepped post-cures are available if your oven temperature controller cannot maintain this heat-up rate. Please refer to ACG Technical Department.

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

Technical Data

Matrix Resin Properties

Cured Resin Properties	Units	LTM26	LTM26EL
Cured Resin Density	g/cm ³	1.18	1.18
Tg after 60°C (140°F) optimum cure (TMA)	°C (°F)	75 (167)	75 (167)
Tg after post-cure to 120°C (248°F) (TMA)	°C (°F)	125 (257)	133 (271)

Typical Mechanical Properties

Unidirectional Carbon Laminates - 34-700 - Laminated and tested in the 0° direction.

Type of Cure Process			LTM26		LTM26EL	
			After Initial Vacuum Bag Cure	After Free-standing Post-cure	After Initial Vacuum Bag Cure	After Free-standing Post-cure
Cure Condition	Temp	°C (°F)	60 (140)	120 (250)	60 (140)	120 (250)
	Time	Hours	14	1	14	1
	Pressure	("Hg)	27	-	27	-
ILSS (MPa)	RT	Dry	81	83	80	81
	RT	Wet	82	81	80	79
	50°C (122°F)	Dry	65	72	59	67
	50°C (122°F)	Wet	-	68	-	68
	100°C (212°F)	Dry	-	53	-	51
	100°C (212°F)	Wet	-	48	-	48
Ultimate Flexural Strength (MPa)	RT	Dry	2061	1764	2052	1919
	RT	Wet	1773	1780	1980	1916
	50°C (122°F)	Dry	1474	1582	1764	1554
	50°C (122°F)	Wet	-	1455	-	1530
	100°C (212°F)	Dry	-	1508	-	1482
	100°C (212°F)	Wet	-	1241	-	1269
Ultimate Flexural Modulus (GPa)	RT	Dry	142	127	139	129
	RT	Wet	137	136	130	136
	50°C (122°F)	Dry	118	122	122	120
	50°C (122°F)	Wet	-	132	-	127
	100°C (212°F)	Dry	-	138	-	132
	100°C (212°F)	Wet	-	136	-	141
Tg (TMA) °C (°F)			76 (168)	134 (273)	75 (167)	130 (266)
Mean water absorption % after wet conditioning (see note 2).			0.35	0.35	0.35	0.35

Flexural results are normalised to 60 % Vf. Wet Test condition = 2 hour boil in deionised water.

Woven Carbon Laminates - 285 gsm 4x4 Twill T300 - Fibres @ 0/90 (warp 0°) tested in the warp direction.

Type of Cure Process			LTM 26		LTM 26EL	
			After Initial Vacuum Bag Cure	After Free-standing Post-cure	After Initial Vacuum Bag Cure	After Free-standing Post-cure
Cure Condition	Temp	°C (°F)	60 (140)	120 (250)	60 (140)	120 (250)
	Time	Hours	14	0.5	14	0.5
	Pressure	("Hg)	27	-	27	-
ILSS (MPa)	RT	Dry	71	65	67	62
	RT	Wet	61	59	55	53
	50°C (122°F)	Dry	59	59	54	55
	50°C (122°F)	Wet	-	55	-	52
	100°C (212°F)	Dry	-	42	-	41
	100°C (212°F)	Wet	-	37	-	35
Ultimate Flexural Strength (MPa)	RT	Dry	1101	1036	1076	1043
	RT	Wet	963	955	859	896
	50°C (122°F)	Dry	1076	939	919	846
	50°C (122°F)	Wet	-	852	-	819
	100°C (212°F)	Dry	-	779	-	695
Ultimate Flexural Modulus (GPa)	RT	Dry	63	58	60	60
	RT	Wet	53	56	55	55
	50°C (122°F)	Dry	61	56	59	52
	50°C (122°F)	Wet	-	53	-	53
	100°C (212°F)	Dry	-	54	-	50
	100°C (212°F)	Wet	-	53	-	53
Tg (TMA) °C (°F)			76 (168)	134 (273)	75 (167)	130 (266)
Mean water absorption % after wet conditioning (see note 2).			0.35	0.35	0.35	0.35

Flexural results are all normalised to 55 % Vf. Wet Test condition = 2 hour boil in deionised water.

Woven Glass Laminates - 300 gsm 8 Harness Satin (Epoxy Silane) - Fibres 0/90° (Warp 0°) tested in the warp direction.

Type of Cure Process			LTM26EL	
			After Initial Vacuum Bag Cure	After Free-standing Post-cure
Cure Condition	Temp	°C (°F)	60 (140)	120 (250)
	Time	Hours	14	0.5
	Pressure	("Hg)	27	-
ILSS (MPa)	RT	Dry	51	52
	RT	Wet	45	50
	50°C (122°F)	Dry	44	44
	50°C (122°F)	Wet	-	41
	100°C (212°F)	Dry	-	37
	100°C (212°F)	Wet	-	30
Ultimate Flexural Strength (MPa)	RT	Dry	703	660
	RT	Wet	634	617
	50°C (122°F)	Dry	656	625
	50°C (122°F)	Wet	-	547
	100°C (212°F)	Dry	-	523
	100°C (212°F)	Wet	-	435
Ultimate Flexural Modulus (GPa)	RT	Dry	22	25
	RT	Wet	23	24
	50°C (122°F)	Dry	26	21
	50°C (122°F)	Wet	-	22
	100°C (212°F)	Dry	-	21
	100°C (212°F)	Wet	-	20
T _g (TMA) °C (°F)			75 (167)	130 (266)
Mean water absorption % after wet conditioning (see note 2).			0.45	0.20

Flexural results are all normalised to 55 % Vf. Wet Test condition = 2 hour boil in deionised water.

Availability

All ACG LTM26 and LTM26EL Series prepregs are available on a wide range of reinforcing fabrics and unidirectional tapes including glass, carbon, aramid and hybrids.

Out Life and Storage

Note: The out life periods quoted for LTM26 and LTM26EL refer to autoclave curing only. If laminates are to be vacuum bag cured it is recommended that the following reduced out life periods are observed: LTM26 2 days and LTM26EL 4 days.

Storage at -18°C (0°F)	LTM26 and LTM26B	6 months
	LTM26EL, LTM26ELB and LTM26ELFR	12 months
Out Life at 21°C (70°F)	LTM26 and LTM26B	4 days (see note above)
	LTM26EL, LTM26ELFR and LTM26ELFRB	5 to 6 days (see note above)

When not in use, LTM26 Series prepregs should be stored in a sealed polyethylene bag in a freezer. When material is removed from the freezer, it is essential that the roll be allowed to thaw and reach room temperature before the bag is opened. For example, the thaw time for a 15Kg (35lb) roll

taken from -18°C (0°F) storage into a 21°C (70°F) room is typically between 4 and 6 hours. Unless the material is fully thawed, condensation may form on the surface. Moisture within a curing laminate may be detrimental to final part quality and appearance. When materials are returned to the freezer they must be resealed to prevent ingress of moisture.

Health and Safety

ACG LTM26 and LTM26EL Series prepregs contain epoxy resins which can cause allergic reaction on prolonged or repeated skin contact. Gloves and protective clothing must be worn.

Thoroughly wash skin 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, please consult ACG (Material) Safety Data Sheet No.s:

LTM26 and LTM26B:	(M)SDS 133
LTM26EL and LTM26ELB:	(M)SDS 134
LTM26ELFR and LTM26ELB:	(M)SDS 190
LTM26ELFS:	Refer to ACG data sheet PDS1035.