LTM® 16B

LTM16B tooling prepregs are low/medium temperature curing epoxy resins systems that can be post cured to produce tools with a service temperature of 200°C (392°F).

LTM16B prepregs are suitable for the manufacture of both small and large tools.

Features and Benefits

- 6 days out life at 21°C (70°F)
- 12 months storage at -18°C (0°F)
- Autoclave cure
- Mould tools directly from low temperature master
- Prepregs have excellent tack and drape
- Initial cure temperatures down to 40°C (104°F)
- Able to produce tools with low residual stress
- Unsupported (free standing) post-cure
- Low tool shrinkage matched to Syensqo's tooling block expansion during cure
- Low tool coefficient of thermal expansion (CTE) matched with Syensqo-supplied backing structures
- Good retention of mechanical properties up to 180°C (356°F) when fully post cured
- Long term service up to 200°C (392°F) in air

RELATED DOCUMENTS

- De-bulking guidelines (TDS1036)
- Epoxy tooling prepregs – lay-up and bagging guidelines (TDS1040)
- Autoclave processing lay-up and bagging guidelines (TDS1037)

CURE CYCLE

Autoclave cures

LTM16

Vacuum bag pressure	Minimum of 980mbar (29"Hg)*
Autoclave pressure	6.2 bar (90 psi)
Ramp rate	0.3 to 0.5°C (0.54 to 0.9°F)/minute
Recommended cure cycle	15 hours @ 60°C (140°F)
Cool down	Maximum of 3°C (5.4°F)/minute to room temperature

Alternative LTM16 cure cycles

Temperature	Recommended cure duration
40°C (104°F)	70 hours
50°C (122°F)	35 hours
70°C (158°F)	8 hours
80°C (176°F	4 hours
90°C (194°F)	2 hours

Notes:

- Due to the highly exothermic nature of the material, it is not recommended to cure at temperatures above 90°C (194°F).
- In situations where autoclave time is limited, it is feasible to autoclave cure the part to the minimum cure time and then place it in an oven to complete the required cure cycle time. If you wish to do this, please contact technical support for more information.

POST-CURE

In applications demanding maximum temperature or environmental resistance, it is essential that the component is post cured to fully develop the glass transition temperature.

Ramp rate	0.3°C (0.5°F)/minute
Recommended post cure cycle	15 minutes at 200°C (392°F) + 8 hours at 190°C (374°F)
Cool down	3°C (5.4°F))/minute to 60°C (140°F)

* Temperature must be measured by the lagging thermocouple attached to the part.

Notes:

- Parts may be loaded into a pre-heated oven or heated at 3°C (5°F)/minute to the initial cure temperature.
- Large components should be adequately supported to avoid distortion.

PHYSICAL PROPERTIES

Typical properties for LTM10 series resins/prepregs

Test	Sample/test conditions	Results	
Cured resin density	Post cured samples	LTM16B	1.21 g/cm3
TMA Tg	Cure at 40°C (104°F), dry Cure at 50°C (122°F), dry Cure at 60°C (140°F), dry Fully post cured	55°C (131°F) 65°C (149°F) 75°C (167°F) 205 – 210°C (401 – 410°F)	
Shrinkage	Post cured laminates	Carbon tool Glass tool	0.05%* 0.12%*
Coefficient of thermal expansion (CTE)	Post cured laminates tested from 21°C (70°F) to 180°C (356°F)	Carbon tool Glass tool	2 – 3 x10-6/°C (1.1 – 1.7 x10-6/°F) 10.5 – 12 x10-6/°C (5.8 – 6.7 x10-6/°F)

*Shrinkage is dependent on construction and processing. Figures quoted are based on Syensqo's standard LTM10 series tooling laminates using standard carbon and glass fabrics.

MECHANICAL PROPERTIES

LTM16-T-12KHS-2X2T-660

Cure: 12 hours at 60°C (140°F), 6.2 bar (90psi) pressure

Post-cure: 15 minutes at 200°C (392°F) + 8 hours at 190°C (374°F)

Test conditions: Room temperature, dry

Test	Test method	Units	Results
0° Tensile strength	ASTM D3039	MPa (ksi)	443.0 (64.3)
0° Tensile modulus		GPa (msi)	58.5 (8.48)
0° Compressive strength	ASTM D6641	MPa (ksi)	326.0 (47.3)
0° Compressive modulus		GPa (msi)	55.7 (8.07)

Data normalised to 55%Vf

LTM® 16B

TOOLING PREPREG

AVAILABILITY

LTM16B series prepregs are available on the following fabrics.

3KHS-2X2T-199: 199 g/m2 2x2 twill weave, 3K HS carbon fibre

12KHS-2X2T-660: 660 g/m2 2x2 twill weave, 12K HS carbon fibre

EG-7781-300: 300 g/m2 8 end satin weave, E glass fibre

EGLASS-8H-850: 850 g/m2 8 end satin weave, E glass fibre

EGLASS-2X2T-876: 876 g/m2 2x2 twill weave, E glass fibre

STORAGE

Out life* at 21°C (70°F)	6 days
Storage at -18°C (0°F)	12 months from date of manufacture

*Out life refers to accumulated time out of the freezer before the part is cured.

Note:

The actual freezer storage life and out life are dependent on a number of factors, including; fibre type, format and application. For certain formats, it may be possible for the storage life and out life to be longer than stated. Please contact our technical support staff for advice.

EXOTHERM

LTM16B series prepregs are reactive formulations which can undergo severe exothermic heat 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 and bagging procedures are adhered to, especially when moulding solid laminates that are 6-7mm (0.24-0.28inch) thickness. This applies to the standard 1-8-1 Syensqo tooling lay-up (one surface ply + eight bulk plies + one surface ply). The risk of exotherm increases with lay-up thickness and increasing cure temperature. 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 our technical department for further information on exotherm behaviour of these systems.

HEALTH & SAFETY

Please refer to the product SDS for safe handling, personal protective equipment recommendations and disposal considerations.