

LTM[®] 10 SERIES

LTM10 series tooling prepregs are low temperature curing epoxy resins systems that can be post cured to produce tools with a service temperature of 200°C (392°F).

These series of prepregs are suitable for the manufacture of small to large tools.

Features and Benefits

- 2 to 6 days out life at 21°C (70°F)
- Minimum of 6 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 20°C (68°F)
- Able to produce tools with low residual stress
- Unsupported (free standing) post-cure
- Low tool shrinkage matched to Solvay's tooling block expansion during cure
- Low tool coefficient of thermal expansion (CTE) matched with Solvay-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

PRODUCT VARIANTS

- LTM12: Suitable for low temperature initial cure of small-medium tools
- LTM16: Suitable for low to medium temperature initial cure of large tools due to longer out life.

RELATED DOCUMENTS

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

RELATED PRODUCTS

- PS501 pre-release treatment (PDS1010)
- RA815 release agent (PDS1022)
- LS416 laminating resin (PDS1050)
- FS233B and FS233BLV tool repair filler and pit filler (PDS1182)
- Tooling backing structure range (PDS1025 [Europe]/ PDS1267 [USA])

LTM[®] 10 SERIES TOOLING PREPREG



CURE CYCLE

Autoclave cures

LTM12

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	5 hours at 70°C (158°F)
Cool down	Maximum of 3°C (5.4°F)/minute to room temperature

Alternative LTM12 cure cycles

Temperature	Recommended cure duration
30°C (86°F)	70 hours
40°C (104°F)	35 hours
50°C (122°F)	20 hours
60°C (140°F)	10 hours
80°C (176°F)	3 hours

Notes:

- Due to the highly exothermic nature of the material, it is not recommended to cure at temperatures above 80°C (176°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.

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
Minimum temperature cure cycle	4 hours at 80°C (176°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
60°C (140°F)	15 hours
70°C (158°F)	8 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.

LTM[®] 10 SERIES TOOLING PREPREG



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	LTM12 LTM16	1.22 g/cm ³ 1.21 g/cm ³
TMA Tg	Cure at 30°C (86°F), dry Cure at 40°C (104°F), dry Cure at 50°C (122°F), dry Cure at 60°C (140°F), dry Fully post cured	45°C (113°F)** 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 Solvay's standard LTM10 series tooling laminates using standard carbon and glass fabrics.

**Dependent on particular resin system.



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

AVAILABILITY

LTM10 series prepregs are available on a range of 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

LTM[®] 10 SERIES TOOLING PREPREG



STORAGE

Out life* at 21°C (70°F)	LTM12 LTM16	3 days 6 days
Storage at -18°C (0°F)	LTM12 LTM16	6 months from date of manufacture 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

LTM10 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 Solvay 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 MSDS for safe handling, personal protective equipment recommendations and disposal considerations.

