LTM® 110 SERIES

LTM110 series prepregs are high service temperature cyanate ester resin system capable of initial cure at temperatures as low as 70°C (158°F). After a suitable post-cure, the glass transition temperature can be increased to a maximum of 330°C (626°F), thus allowing components to withstand short duration thermal spikes up to this temperature.

LTM110 series component prepregs have been specifically developed for applications where the best dimensional stability is required over a wide temperature range, and where tooling suitable for high temperature autoclave curing is not available.

Features and Benefits

- 3 days out life at 21°C (70°F)
- 6 months storage life at -18°C (0°F)
- 70°C (158°F) initial cure
- Autoclave cure
- Good dimensional stability and thermal durability up to 250°C (482°F) after post-cure
- Maximum Tg of 330°C (626°F); can withstand thermal spikes to 330°C (626°F)
- Inherently flame retardant, with low toxic gas and smoke generation
- Good dielectric properties for radar transparency

PRODUCT VARIANTS

- LTM110-5: For unidirectional prepregs
- LTA110-5: Film for bonding applications

RELATED DOCUMENTS

- De-bulking guidelines (TDS1036)
- Cyanate ester prepreg - lay-up and bagging guidelines (TDS1039)

CURE CYCLE

Vacuum bag pressure	Minimum of 980 mbar (29"Hg)*
Autoclave pressure	6.2 bar (90 psi)** Vent vacuum when pressure reaches 1bar (0.04" Hg)
Ramp rate	1 to 3°C (1.8 to 5.4°F)/minute
Recommended cure cycle	20 hours at 70°C (158°F)
Minimum duration cure cycle	16 hours at 70°C (158°F)
Cool down	Maximum of 3°C (5.4°F)/minute to 60°C (140°F)

*This is the ideal vacuum level, however, it is recognised that it is not always possible to attain. If in doubt, please contact our technical support staff for advice.

**If producing sandwich panels, apply the maximum pressure allowable for the honeycomb type.

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.

Syensqo recommends performing the post-cure immediately after the initial cure has been completed, and that a minimum post-cure of 1 hour at 150°C (302°F) is applied. This will avoid the risk of moisture absorption by the partially cured polymer and the subsequent problems, see TDS1039 for further information.

Post-curing above 250°C (482°F) will increase the Tg to a maximum of 330°C (626°F). However, there will be degradation and possible charring of the polymer which can limit the in-service life and may impact dielectric and mechanical performance.

Ramp rate	0.3°C (0.5°F)/minute
Recommended post-cure cycle	2 hours at 250°C (482°F) for prolonged use at 250°C (482°F)*
Maximum temperature post-cure cycle	2 hours at 300°C (572°F) for thermal spiking to 330°C (626°F)*
Cool down	Maximum of 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 (5.4°F)/minute to the initial cure temperature. Large components should be adequately supported to avoid distortion.

PHYSICAL PROPERTIES

Test	Sample conditions	Results		
Cured resin density	20 hours at 70°C (158°F) + 2 hours at 250°C (482°F)	1.28 g/cm^3		
DMA E' onset Tg	16 hours at 70°C (158°F), dry 2 hours at 250°C (482°F), dry 30 minutes at 300°C (572°F), dry	80°C (175°F) 300°C (572°F) 330°C (626°F)		
		Test frequency	Dielectric constant e'	Loss factor e"
Cured resin dielectric properties	20 hours at 70°C (158°F) + 0.5 hours at 250°C (482°F)	14.0 GHz	2.98	0.016
		21.0 GHz	2.89	0.017

MECHANICAL PROPERTIES

Thermal stability in air at 250°C (482°F)

Material: **LTM110/T300(3k-280 g/m²-4x4twill carbon fabric 55%Vf (2mm)**
Cure: 20 hours at 70°C (158°F), 6 bar (90psi) pressure
Post-cure: 0.5 hours at 250°C (482°F)

Time at 250°C (482°F)	Interlaminar shear strength (ILSS) MPa (ksi)		Flexural Strength MPa (ksi)		Flexural Modulus GPa (msi)		Weight Loss (%)
	21°C (70°F)	180°C (356°F)	21°C (70°F)	180°C (356°F)	21°C (70°F)	180°C (356°F)	
Test Method	ASTM D2344		CRAG 200		CRAG 200		
0 hours	34.0 (4.90)	44.0 (6.30)	773.0 (112.0)	665.0 (964.2)	55.0 (8.00)	47.0 (6.80)	0.00
100 hours	32.0 (4.60)	38.0 (5.50)	608.0 (88.0)	724.0 (105.0)	45.0 (6.50)	51.0 (7.40)	0.60
200 hours	31.0 (4.50)	33.0 (4.80)	851.0 (123.4)	788.0 (114.2)	53.0 (7.60)	49.0 (7.10)	0.80
400 hours	32.0 (4.60)	33.0 (4.80)	828.0 (120.0)	776.0 (112.5)	57.0 (8.20)	48.0 (7.00)	1.30
600 hours	38.0 (5.50)	37.0 (5.40)	792.0 (115.0)	872.0 (126.4)	48.0 (7.00)	50.0 (7.20)	1.80
800 hours	38.0 (5.50)	37.0 (6.20)	864.0 (125.3)	859.0 (124.5)	49.0 (7.10)	53.0 (7.70)	2.20
1000 hours	44.0 (6.40)	40.0 (5.80)	761.0 (110.3)	904.0 (131.0)	48.0 (7.00)	52.0 (7.50)	2.80

Thermal stability in nitrogen up to 400°C (752°F)

Material: **LTM110/T300(3k-280g/m²-4x4twill carbon fabric 55% Vf**
Cure: 20 hours at 70°C (158°F), 6 bar (90psi) pressure
Post-cure: 0.5 hours at 250°C (482°F)

Aging temp °C (°F)	Aging time (hours)	Weight Loss %		Interlaminar shear strength (ILSS) MPa (ksi)	Comments
		Resin	CF laminate		
250 (482)	0	-	-	37.0 (5.40)	-
250 (482)	50	-	-	36.0 (5.20)	-
250 (482)	100	-	-	-	-
300 (572)	50	-	-	31.0 (4.50)	-
300 (572)	100	6.80	5.70	31.0 (4.50)	Slight defects
350 (662)	100	17.2	9.10	-	Delaminated
400 (752)	100	23.2	11.4	-	Blistered

Material: LTM110/Quartz 581 fabric
Cure: 1 hour at 120°C (248°F), 6 bar (90psi) pressure
Post cure: 1 hour at 150°C (482°F)

Test	Test method	Units	Test temperature/conditions	
			21°C (70°F), dry	125°C (257°F), dry
0° Tensile strength	ASTM D3039	MPa (ksi)	619.0 (89.8)	618.0 (89.6)
0° Tensile modulus		GPa (msi)	26.0 (3.77)	26.0 (3.77)
0° Compressive strength	ASTM D3410	MPa (ksi)	423.0 (61.3)	392.0 (56.8)
0° Compressive modulus		GPa (msi)	25.5 (3.70)	-
In-plane shear strength (IPSS)	ASTM D3518	MPa (ksi)	130.0 (18.8)	101.0 (14.6)
In-plane shear modulus (IPSM)		GPa (msi)	7.87 (1.14)	8.66 (1.25)

AVAILABILITY

LTM110 series prepregs are available in a wide range of reinforcing fabrics and unidirectional tapes, including glass, carbon, aramid and hybrids.

LTA110-5 is available in film weights of 150 to 300 g/m^2.

STORAGE

Out life* at 21°C (70°F)	3 days
Storage at -18°C (0°F)	6 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

LTM® 110 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/bagging procedures are adhered to, especially when moulding solid laminates in excess of 10mm (0.4in) thickness. 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.

HEALTH & SAFETY

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