SE 75

High Performance Prepreg System

- New generation, hot melt, epoxy prepreg
- Builds on the established heritage and performance of SE84LV, with more versatile cure possibilities
  - 12 hours at 70ºC (158ºF)
  - 6 hours at 80ºC (176ºF)
  - 35 minutes at 120ºC (248ºF)
- Exceptional mechanical and thermal performance
- 8 weeks shelf life at 18-22°C (73ºF)
- Optimised for large structure vacuum bag processing
- Suitable for a wide range of Marine and Industrial applications
- Specifically formulated for large open mould vacuum processes
- Lloyd's Register Certified Formats Available

INTRODUCTION

SE 75 is an extremely versatile hot melt epoxy prepreg system. It builds on the established good handling and performance of SE 84LV but has more versatile cure possibilities from 12 hours at 70ºC (158ºF) to 45 minutes at 120ºC (248ºF), whilst maintaining an 8 week shelf life at 18-22°C. This flexibility combined with its exceptional mechanical and thermal performance makes it suitable for a wide range of marine and industrial applications.

TYPICAL END USE APPLICATIONS

SE 75 can be used for any high-performance structure. Its long shelf life at 18-22°C means it is particularly suited to large components that need to remain in mould for long durations prior to curing.

INSTRUCTIONS FOR USE

PREPARATION

When preparing the lay-up the prepreg should be removed from the freezer and allowed to thaw in a sealed bag. This may take 6 to 24 hours depending on roll size. This prevents atmospheric moisture from condensing on the prepreg which may cause voiding on cure. The mould surface should be release coated and must have been tested for vacuum integrity prior to lay-up.

LAYING-UP

The following procedure is recommended for preparing out of autoclave vacuum cured laminates.

1. Place the lay-up on a tool which has been treated with a high temperature release agent or film. Insert a thermocouple into the lay-up near the centre ply of the thickest edge section, outside the net trim line.

2. Apply a peel ply to the surface of the lay-up if required, a heat scoured nylon peel ply is strongly recommended. For thin laminates a prepreg peel ply should be considered to prevent over bleed of resin. Cover the peel ply entirely with a low bleed perforated release film. Typically a minimum of 150g/m² breather fabric should be used to control the resin bleed and air flow.

3. Install a vacuum bag. Position part in the oven or autoclave and draw vacuum to check for bag or system leaks.

4. It is not recommended to cure SE 75 under vacuum pressures of less than 85%.

5. Cure as described in the following section

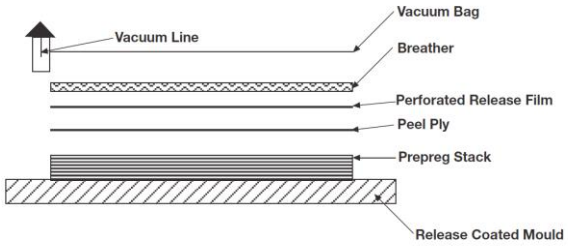
6. Upon completion of cure, turn off heat and cool until part temperature has fallen below 60°C (140°F). When fully cooled, the part may be debagged, trimmed and machined as necessary. A post-cure is not required.

CORE BONDING

This product can be used in conjunction with typical core materials. Representative test panels should be made to ensure that the laminate construction, curing method and other variables allow full filling of any cuts or slits in the foam. The cure cycles given in this datasheet are for typical monolithic flat panels and may not be appropriate for sandwich panels.

When using Nomex™ or aluminium honeycombs, the separate SA75-90 adhesive film is recommended and full details of use are provided on the product data sheet. This adhesive film can be supplied with or without lightweight glass carrier, or in some cases it can be supplied directly coated onto one face of the SE 75 prepreg.

The system is fully compatible with Ampreg wet layup epoxy systems and therefore all types of cores may be bonded to a first skin by using a separate 'wet-bonding' operation. In this case, the addition of filler powders to the appropriate resin system is required to provide the correct paste-like consistency.



THIN LAMINATES

When using very thin laminates (e.g. with a total laminate fibre weight of less than 300-400gm^2), care needs to be taken to avoid extracting excessive amounts of resin during the cure process. To avoid this, a microporous release film can be used, and for particularly critical components, a prepreg peel ply should be used.

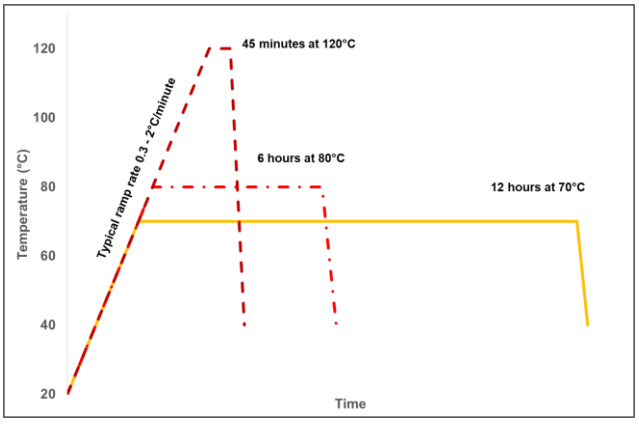
CURE CYCLE

Commence the heat-up cycle, between 0.3°C (0.5°F)/min and 2°C (3.6°F)/min to the final cure temperature. At 70°C (158°F), the temperature should be held for 12 hours. Faster cures are obtained at elevated temperatures, e.g. 6 hours at 80°C (176°F), 45 minutes at 120°C (248°F). All temperatures measured by thermocouple installed on the laminate surface. Vacuum should be maintained as high as possible throughout the cure cycle.

If a ramp rate of less than 0.3°C/min (0.5°F/min) is used, users should satisfy themselves that this allows adequate resin flow.

CURING AT 70°C (158°F)

When curing at 70°C (158°F) it is important to ensure the temperature is monitored from the lowest thermocouple reading in the laminate. 70°C (158°F) should be treated as the minimum cure temperature for SE75; 65-70°C (149-158°F) will not generate adequate mechanical properties.



PRODUCT INFORMATION

AVAILABILITY

SE 75 is available in unidirectional carbon formats ranging in weight from 120 to 600g/m^2, also woven or multiaxial reinforcements in carbon or glass from 100-1200g/m^2. The product formats listed to the right also benefit from 3rd Party Certification.

COMPATIBLE ADHESIVE FILMS

SA75-90 adhesive film has been developed specifically for this prepreg system. This can be supplied with or without a supporting medium in 150g to 400g film weights.

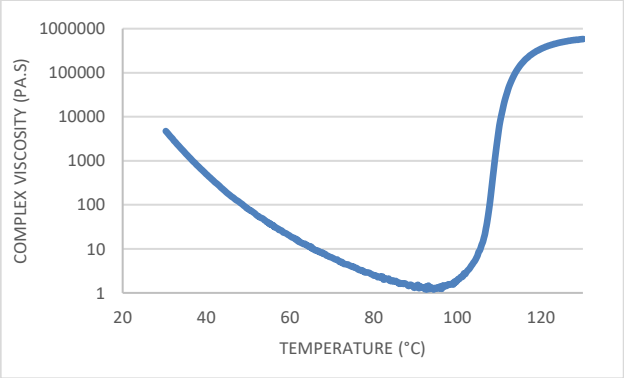
PRODUCT DESCRIPTION	STATUS	CERTIFICATION
SE 75 HMC UD Prepreg 150 - 600g/m^2	Valid	Lloyds Register LR21106133ALP-01
SE 75 HEC UD Prepreg 150 - 600g/m^2	Valid	Lloyds Register LR21106188ALP
SE 75 IMC UD Prepreg 150 - 600g/m^2	Valid	Lloyds Register LR21106189ALP
SE 75 RC Series Prepreg RC200T – RC660T	Valid	Lloyds Register LR21106185ALP
SE 75 XC Series Prepreg XC150 – XC611	Valid	Lloyds Register LR21106184ALP-01
SE 75 XC Series Prepreg XC150 – XC611	Valid	DNV-GL TA-DNVGL-CP-0431-07273-0

PREPREG PROPERTIES

RHEOLOGY DATA

SE 75 resin viscosity profile conducted at 1°C (1.8°F)/minute.

PROPERTY	VALUE	
Minimum Viscosity	1.2 Pa.s	12 P
Temperature at Minimum Viscosity	94 °C	201°F



TRANSPORT & STORAGE

When stored sealed & out of direct sunlight.

STORAGE TEMP		UNIT	VALUE
-18°C	0°F	months	24
+18-22°C	64-72°F	weeks	8

All prepreg materials should be stored in a freezer when not in use to maximise their useable life, since the low temperature reduces the reaction of resin and catalyst to virtually zero. However, even at -18°C (0°F) the temperature of most freezers, the material will eventually become unworkable.
When not in use SE 75 products should be maintained at -18°C (0°F). To avoid condensation allow the rolls to reach room temperature before removing the plastic wrapping.

HEALTH AND SAFETY

Please refer to SDS for up to date information specific to this product.

TYPICAL CURE TIME & TEMPERATURES

0.3ºC (0.5ºF)/min should be considered the minimum ramp rate. Alternative cure cycles and processes can be used.

PROPERTY	70°C CURE (158°F)	80°C CURE (176°F)	120°C CURE (248°F)	TEST STANDARD
Processing Method	Vacuum Bag / Autoclave	Vacuum Bag / Autoclave	Vacuum Bag / Autoclave	
Typical Ramp Rate	0.3 – 2°C/minute	0.3 – 2°C/minute	0.3 – 2°C/minute	-
Cure Time	12 hrs*	6hrs*	45 minutes*	-
Cure Pressure	-1 Bar / +6 Bar	-1 Bar / +6 Bar	-1 Bar / +6 Bar	-
Dry Tg (DMA)	85°C	98°C	125°C	ASTM D7028

*** Please refer to each product Technical Datasheet for minimum cure of ancillary products SA75-90, SFG75-90, SF75-90 and MP75-90.**

MECHANICAL PROPERTIES

CURED RESIN PROPERTIES

Resin cast oven cured for 12 hours at 70°C (158°F). Mean values.

PROPERTY	SYMBOL	UNIT	12 HOURS @ 70 °C (158°F)	6 HOURS @ 80°C (176°F)	45 MINUTES @ 120°C (248°F)	TEST STANDARD
Cured resin density	ρ_{cured}	g/cm²	1.19	1.19	1.19	Archimedean principle
Tensile Strength	σ_T	MPa	68	82	83	ISO 527-2
Tensile Modulus	E_T	GPa	3.8	3.4	3.0	ISO 527-2
Flexural Strength	σ_F	MPa	117	123	117	ISO 178
Flexural Modulus	E_F	GPa	3.8	3.5	2.9	ISO 178
Compressive Yield Strength	σ_C	MPa	147	140	117	ISO 604

UNIDIRECTIONAL LAMINATE PROPERTIES

Mean values derived from data from a single batch, cured 6 hours at 80°C (176°F). Customers with specific requirements must carry out tests to prove conformity.

PROPERTY	SYMBOL	UNIT	HEC FIBRE 150g/m²	HEC FIBRE300g/m²	HEC FIBRE 600g/m²	TEST STANDARD
Typical Fibre Density	ρ_{fibre}	g/cm³	1.8	1.8	1.8	-
Fibre Modulus	E_{fibre}	GPa	227-257	227-257	227-257	-
Resin Content	-	%	32-37	32-37	32-37	ASTM D3171 Method II
Fibre Volume Fraction	V_f	%	55	56	55	ASTM D3171 Method II
0° Tensile Strength**	X_T	MPa	2775	2494	2188	ISO527-5
0° Tensile Modulus **	E_T	GPa	138	141	144	ISO527-5
0°Compressive Strength**	X_C	MPa	1356	1390	1410	SACMA SRM1-94
0°Compressive Modulus**	E_{C11}	GPa	120	126	130	SACMA SRM1-94
90° Tensile Strength	Y_T	MPa	49	38	21	ISO527-5
90° Tensile Modulus	E_{T22}	GPa	8.7	8.7	8.6	ISO527-5
0° Flexural Strength	X_F	MPa	1490	1538	1450	ISO14125
0° Flexible Modulus	E_{F11}	GPa	107	109	122	ISO14125
0° ILSS	X_{ILSS}	MPa	86	85	86	ISO14130

** Normalised to 60% V_f

PROPERTY	SYMBOL	UNIT	IMC FIBRE 150g/m²	IMC FIBRE300g/m²	IMC FIBRE 450g/m²	TEST STANDARD
Typical Fibre Density	ρ_{fibre}	g/cm³	1.79	1.79	1.79	-
Fibre Modulus	E_{fibre}	GPa	275-310	275-310	275-310	-
Resin Content	-	%	32-37	32-37	32-37	ASTM D3171 Method II
Fibre Volume Fraction	V_f	%	58	59	58	ASTM D3171 Method II
0° Tensile Strength**	X_T	MPa	2765	2722	2511	ISO527-5
0° Tensile Modulus **	E_T	GPa	172	177	172	ISO527-5
0°Compressive Strength**	X_C	MPa	1450	1422	1458	SACMA SRM1-94
0°Compressive Modulus**	E_{C11}	GPa	157	143	152	SACMA SRM1-94
90° Tensile Strength	Y_T	MPa	33	39	TBA	ISO527-5
90° Tensile Modulus	E_{T22}	GPa	8.3	7.9	TBA	ISO527-5
0° Flexural Strength	X_F	MPa	1387	1474	TBA	ISO14125
0° Flexible Modulus	E_{F11}	GPa	134	134	TBA	ISO14125
0° ILSS	X_{ILSS}	MPa	86	88	81	ISO14130

** Normalised to 60% V_f

PROPERTY	SYMBOL	UNIT	HMC FIBRE 150g/m²	HMC FIBRE300g/m²	HMC FIBRE 600g/m²	TEST STANDARD
Typical Fibre Density	ρ_{fibre}	g/cm³	1.8	1.81	1.8	-
Fibre Modulus	E_{fibre}	GPa	365-405	365-405	365-405	-
Resin Content	-	%	32-37	32-37	32-37	ASTM D3171 Method II
Fibre Volume Fraction	V_f	%	58	57	61	ASTM D3171 Method II
0° Tensile Strength**	X_T	MPa	2515	2318	2226	ISO527-5
0° Tensile Modulus **	E_T	GPa	223	208	221	ISO527-5
0°Compressive Strength**	X_C	MPa	1322	1122	1115	SACMA SRM1-94
0°Compressive Modulus**	E_{C11}	GPa	194	187	186	SACMA SRM1-94
90° Tensile Strength	Y_T	MPa	-	26	21.8	ISO527-5
90° Tensile Modulus	E_{T22}	GPa	-	7	7.2	ISO527-5
0° Flexural Strength	X_F	MPa	1319	1397	1349	ISO14125
0° Flexible Modulus	E_{F11}	GPa	178	200	163	ISO14125
0° ILSS	X_{ILSS}	MPa	81	86	82	ISO14130

** Normalised to 60% V_f

CARBON WOVEN LAMINATE PROPERTIES

Mean values derived from data from a single batch cured using standard processing techniques and standard cure of 6 hours at 80°C (176°F). Where test directions are given, they are with respect to the warp direction of the roll. Fabrics contained in these prepregs are 2X2 twill woven with High Elongation Carbon (HEC).

PROPERTY	SYMBOL	UNIT	RC200T	RC416T	RC660T	TEST STANDARD
Uncured Resin Content	-	%	39-45	39-45	39-45	ASTM D 3171 Method II
Cured Ply Thickness	-	mm	0.18	0.43	0.64	ASTM D792
Fibre Volume Fraction	V_f	%	49	48	58	ASTM D 3171 Method II
0° Tensile Strength*	X_T	MPa	751	909	963	ISO 527-4
0° Tensile Modulus*	E_T	GPa	71	63	59	ISO 527-4
0° Flexural Strength	X_F	MPa	853	832	-	ISO 527-4
0° Flexible Modulus	E_{F11}	GPa	53	51	-	ISO 527-4
0° Compressive Strength*	X_C	MPa	743	681	496	SACMA SRM1-94
0° Compressive Modulus*	E_{C22}	GPa	62	54	54	SACMA SRM1-94
ILSS	t_M	MPa	63	53	50	ISO 14130

*Normalised to 55% fibre volume fraction

BIAXIAL (+/-45°) CARBON LAMINATE PROPERTIES

Mean values derived from data from a single batch. Where test directions are given, they are with respect to the direction of the roll. Cured (158° F). Fabrics contained in these products are 2 layers of unidirectional High Elongation Carbon (HEC) fibres stitched together at +/-45° HEC fibres are characterised by having a tensile modulus between 227-257GPa

PROPERTY	SYMBOL	UNIT	XC150	XC411	XC611	TEST STANDARD
Resin Content	-	%	42	42	42	ASTM D 3171 Method II
Cured Ply Thickness	-	mm	0.16	0.43	0.61	ASTM D792
Fibre Volume Fraction	V_f	%	53	52	56	ASTM D 3171 Method II
+45° Tensile Strength*	X_T	MPa	1128	992	726	ISO 527-4
+45° Tensile Modulus*	E_T	GPa	62	67	66	ISO 527-4
-45° Tensile Strength*	X_T	MPa	1193	857	723	ISO 527-4
-45° Tensile Modulus*	E_T	GPa	59	67	66	ISO 527-4
+45° Flexural Strength	X_F	MPa	930	1013	-	ISO 527-4
+45° Flexible Modulus	E_{F11}	GPa	54	56	-	ISO 527-4
-45° Flexural Strength	X_F	MPa	987	903	-	ISO 527-4
-45° Flexible Modulus	E_{F11}	GPa	56	58	-	ISO 527-4
+45° Compressive Strength*	X_C	MPa	694	739	432	SACMA SRM1-94
+45° Compressive Modulus*	E_{C22}	GPa	56	58	59	SACMA SRM1-94
-45° Compressive Strength*	X_C	MPa	690	702	553	SACMA SRM1-94
-45° Compressive Modulus*	E_{C22}	GPa	56	60	61	SACMA SRM1-94
ILSS	t_M	MPa	65	56	34	ISO 14130

*Normalised to 55% fibre volume fraction

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The Company strongly recommends that Customers make test panels in the final process conditions and conduct appropriate testing of any goods or materials supplied by the Company prior to final use to ensure that they are suitable for the Customer's planned application. Such testing should include testing under conditions as close as possible to those to which the final component may be subjected. The Company specifically excludes any warranty of fitness for purpose of the goods other than as set out in writing by the Company. Due to the varied nature of end-use applications, the Company does, in particular, not warrant that the test panels in the final process conditions and/or the final component pass any fire standards.

The Company reserves the right to change specifications and prices without notice and Customers should satisfy themselves that information relied on by the Customer is that which is currently published by the Company on its website. Any queries may be addressed to the Technical Services Department.

Gurit is continuously reviewing and updating literature. Please ensure that you have the current version by contacting your sales contact and quoting the revision number in the bottom left-hand corner of this page.

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