ST90

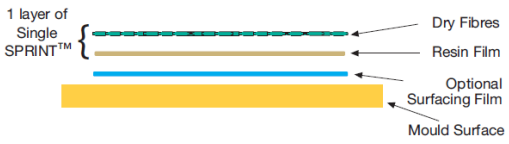
SINGLE SIDED SPRINT™

- Choice of low tack (T0) and medium tack (T1) variants
- Drape and tackiness optimised for excellent handling
- Ideal for complex or vertical mouldings
- Low void content, Out of Autoclave processing
- Diuron free formulation
- DNVGL certified formats available

INTRODUCTION

ST90 single sided SPRINT™ is a moulding material that consists of a layer of dry reinforcement applied to a pre-catalysed resin film. T1 variants suit use in temperatures below 25°C, the T0 variant is more suitable in temperatures of 25°C and above. All cured properties are the same for both tack variants.

ST90 is a hot-melt epoxy resin designed for marine and industrial applications. It has been formulated to give an ideal tack level at workshop temperatures. It is a simple to use, multi-use system ideal for curing both large and small components in a short space of time. ST90 has a flexible cure envelope of 70ºC (158ºF) to 120°C (248ºF).



Cross-section of 1 ply of Structural SPRINT™

TYPICAL END USE APPLICATIONS

ST90 SPRINT™ has been developed for use in large structures where materials need to remain in the mould for long durations prior to curing.

INSTRUCTIONS FOR USE

PREPARATION

When preparing the lay-up the SPRINT™ 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 SPRINT™ 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.

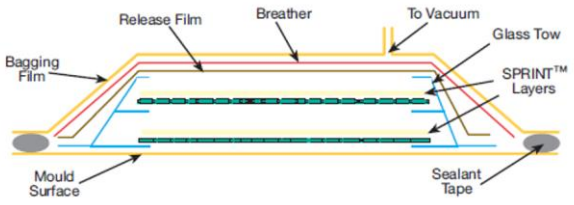
LAYING-UP

The following procedure is recommended for preparing vacuum cured laminates.

1. The moulding surface must first be treated with a release agent. If a Surface Film is required, this should be applied directly to the tool face prior to the lay-up of the SPRINT™. Please refer to Processing Notes for application details.

The required number of plies of SPRINT™ are then placed on to the tool face. A thermocouple may be inserted into the lay-up outside the net trim line. It is important to provide air paths to each ply. This can be achieved by staggering the edges of the plies such that each subsequent ply is smaller by 5-10mm. If space is not available dry glass tows can be inserted between plies of SPRINT™ to provide an air evacuation path out of the laminate. The second end of the tow should be made available for contact with the breather.

2. If required, a peel ply, can be applied over the top of the laminate stack. Note that for good secondary bonding of a peel-plied surface of a laminate, a nylon peel ply is strongly recommended. The peel ply is covered entirely with a low-bleed release film. The release film is then covered with breather material so that it extends over the release film in all directions and contacts the dry glass strands.



Typical processing diagram showing two SPRINT™ layers

3. Once the lay-up is complete, a vacuum bag is installed by standard techniques. At least two vacuum stems should be inserted through the bag, one connecting to the vacuum source and the other, at a point on the part furthest from the source, to a calibrated vacuum gauge. The major benefit of SPRINT™ is that it enables all of the air to be removed from the laminate prior to fibre wet out and resin cure. It is recommended that a vacuum is applied at ambient temperature prior to cure, to fully evaluate the laminate stack. This should be held for between 5 minutes and 1 hour, depending upon the size and thickness of the component. Full vacuum is then maintained throughout the cure.

4. Cure the laminate in accordance with the table given later in this datasheet.

CORE BONDING

If processing SPRINT™ with foam cores, additional resin will be required in order to provide good adhesion and fill any cuts or grooves present in the core.

The additional resin can be provided by using SA75-90 adhesive film between the laminate and core. Gurit can also provide SPRINT™ with a higher resin content which could be used as an alternative or in conjunction with adhesive film.

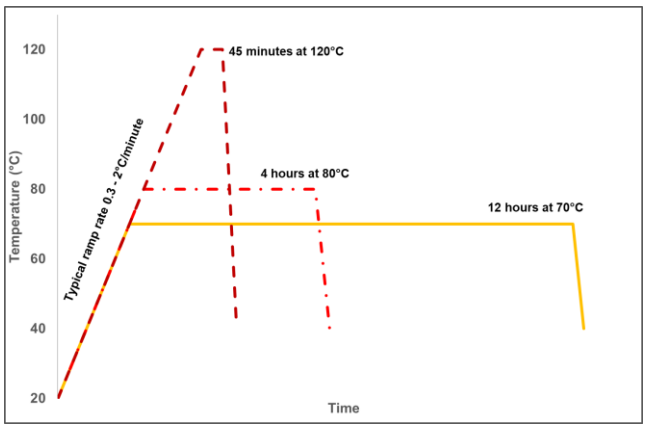
Core type, density, thickness, cut patterns and panel curvature will all have an effect on the additional resin requirement. Representative panels should be made to establish that sufficient additional resin has been used for the core type.

Further advice can be found in the SPRINT™ Processing Notes or by contacting Gurit Technical Support.

CURE CYCLE

ST90 SPRINT™ has a flexible cure envelope. The minimum cure is 10 hours at 70ºC (158ºF), however please refer to each product Technical Datasheet for minimum cure of ancillary products SA75-90, SFG75-90, SF75-90 and MP75-90. Rapid cures can be achieved with 45 minutes at 120ºC (248ºF).

ST90 SPRINT™ works by first applying a vacuum to the laminate stack to remove all air. It is recommended that an ambient vacuum is applied prior to cure, to fully evacuate the laminate stack. The temperature is then increased so that the matrix resin reduces in viscosity and wets the evacuated reinforcement within the laminate. A dwell can be used at the “infusion” temperature to ensure good laminate quality. The temperature is then further increased to cause the matrix resin to cross-link and is then held at the cure temperature until the cross-linking process is complete. Once this is achieved heating is removed so that the temperature is reduced under natural cooling. The vacuum must be maintained throughout the cure until the part has been cooled to 40ºC (104ºF).



PRODUCT INFORMATION

ST90 SPRINT™ is available in either tack variant with glass and carbon reinforcement formats, typically ranging in weight from 300g/m^2 to 1230g/m^2 in glass and 200g/m^2 to 660g/m^2 in carbon.

COMPATIBLE SURFACE FILMS

SPRINT™ can be used in combination with a variety of Gurit surfacing materials, suitable for many different applications. SF75-90 and SFG75-90 have been developed specifically for this SPRINT™ System.

COMPATIBLE ADHESIVE FILMS

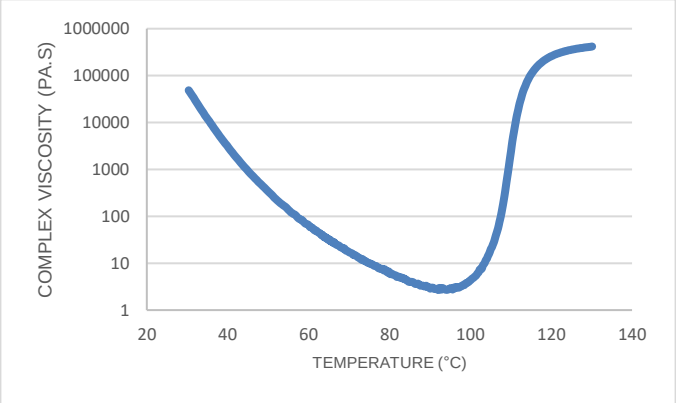
SA75-90 adhesive film has been developed specifically for this SPRINT™ System. This can be supplied with or without a supporting medium in 150g to 400g film weights.

PREPREG PROPERTIES

RHEOLOGY DATA

ST90 resin viscosity profile conducted at 1°C (1.8°F)/minute.

PROPERTY	VALUE	
Minimum Viscosity	2.7 Pa.s	27P
Temperature at Minimum Viscosity	92 °C	197°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	days	21

The ambient storage advice is based on the potential for self-impregnation which can impair air breathing. The rheological and reactivity time at +18-22°C is 8 weeks.

It is recommended that ambient temperature storage is below 22°C (71°F) as higher storage temperatures will induce premature self-impregnation or resin wet-out of the reinforcement. This may impair the air breathing properties of the material. While self-impregnation will vary from product to product, most SPRINT™ materials stored at ambient temperatures will only start to self-impregnate after approximately three weeks.

All SPRINT™ 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, some reaction will still occur. In most cases after some years, the material will become unworkable. To avoid condensation on the rolls allow to reach room temperature before unwrapping.

HEALTH AND SAFETY

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

TYPICAL CURE TIMES & TEMPERATURES

It is recommended that laminate temperatures are monitored throughout the cure. 0.3ºC (0.5ºF)/min should be considered the minimum ramp rate.

PROPERTY	70°C CURE	80°C CURE	120°C CURE	TEST STANDARD
Processing Method	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*	4hrs	45 minutes	-
Cure Pressure	-1Bar Vacuum Bag / 3 - 6 Bar autoclave			-
Dry Tg (DMA)	85°C	86°C	110°C	ASTM D7028

***If using without any of the ST75-90 ancillary products, the cure time at 70°C can be reduced to 10 hours with a resulting Tg c. 76°C. Please refer to each product Technical Datasheet for minimum cure of ancillary products SA75-90, SFG75-90, SF75-90 and MP75-90.**

LAMINATE PROPERTIES

The data provided is a single batch production material tested at Gurit. Customers with specific requirements should contact Gurit technical support who can recommend suitable fibres and formats. All laminates were cured using standard processing techniques and a standard cure of 12 hrs at 70°C.

CURED RESIN PROPERTIES

Resin cast oven cured using standard processing techniques and cure of 6 hours at 85°C (185°F)

PROPERTY	SYMBOL	UNIT	6 HOURS @ 85°C (185ºF)	TEST STANDARD
Tensile Strength	σ_T	MPa	83	ISO 527-2
Tensile Modulus	E_T	GPa	3.7	ISO 527-2
Flexural Strength	σ_F	MPa	137	ISO 178
Flexural Modulus	E_F	GPa	3.1	ISO 178
Cured density	ρ	g/cm³	1.19	Archimedes

WOVEN CARBON LAMINATE PROPERTIES

Where test directions are provided, they are with respect to the warp direction of the roll. Cured 12 hrs at 70°C. Fabrics contained in these products are 2X2 twill woven with High Elongation Carbon (HEC). HEC fibres are characterised by having a tensile modulus between 227-257GPa.

PROPERTY	SYMBOL	UNIT	ST90 / RC200T	ST90/RC416T	ST90/RC660T	TEST STANDARD
Resin Content (nominal)	-	%	42	42	42	ASTM D 3171 Method II
Cured Ply Thickness	-	mm	0.22	0.44	0.7	ASTM D792
Fibre Volume Fraction	V_f	%	50	52	51	ASTM D 3171 Method II
0° Tensile Strength*	X_T	MPa	950	929	971	ISO 527-4
0° Tensile Modulus*	E_T	GPa	69	64	59	ISO 527-4
90° Tensile Strength*	X_T	MPa	911	934	961	ISO 527-4
90° Tensile Modulus*	E_T	GPa	68	56	59	ISO 527-4
0° Compressive Strength*	X_C	MPa	741	662	576	SACMA SRM1-94
0° Compressive Modulus*	E_C	GPa	64	58	56	SACMA SRM1-94
90° Compressive Strength*	X_C	MPa	814	617	500	SACMA SRM1-94
90° Compressive Modulus*	E_C	GPa	64	57	56	SACMA SRM1-94
0° Flexural Strength	X_F	MPa	TBA	804	TBA	ISO 14125
0° Flexural Modulus	E_{F11}	GPa	TBA	52	TBA	ISO 14125
0° Flexural Strength	X_F	MPa	TBA	814	TBA	ISO 14125
0° Flexural Modulus	E_{F11}	GPa	TBA	50	TBA	ISO 14125
ILSS	t_M	MPa	76	53	59	ISO 14130

*Normalised to 55% Fibre Volume

BIAXIAL (+/-45°) CARBON LAMINATE PROPERTIES

Where test directions are provided, they are with respect to the direction of the roll. Cured 12 hrs at 70°C. Fabrics contained in these products are 2 layers of unidirectional High Elongation Carbon (HEC) fibres stitched together at +/-45° to each other. HEC fibres are characterised by having a tensile modulus between 227-257GPa.

PROPERTY	SYMBOL	UNIT	ST90 / XC150	ST90 / XC411	ST90/XC611	TEST STANDARD
Resin Content (nominal)	-	%	42	42	42	ASTM D 3171 Method II
Cured Ply Thickness	-	mm	0.21	0.41	0.70	ASTM D792
Fibre Volume Fraction	-	%	47	55	50	ASTM D 3171 Method II
+45° Tensile Strength*	X_T	MPa	1300	874	675	ISO 527-4
+45° Tensile Modulus*	E_t	GPa	65	63	62	ISO 527-4
-45° Tensile Strength*	Y_T	MPa	1187	832	616	ISO 527-4
-45° Tensile Modulus*	E_{T22}	GPa	64	67	63	ISO 527-4
+45° Compressive Strength*	X_C	MPa	703	644	606	SACMA SRM1-94
+45° Compressive Modulus*	E_c	GPa	60	59	61	SACMA SRM1-94
-45° Compressive Strength*	Y_C	MPa	673	679	554	SACMA SRM1-94
-45° Compressive Modulus*	E_{C22}	GPa	61	58	62	SACMA SRM1-94
+45° Flexural Strength	X_F	MPa	TBA	845	TBA	ISO 14125
+45 Flexural Modulus	E_{F11}	GPa	TBA	51	TBA	ISO 14125
-45° Flexural Strength	X_F	MPa	TBA	1056	TBA	ISO 14125
-45 Flexural Modulus	E_{F11}	GPa	TBA	59	TBA	ISO 14125
ILSS	τ_M	MPa	73	55	42	ISO 14130

*Normalised to 55% fibre volume fraction

BIAXIAL (+/-45°) GLASS LAMINATE PROPERTIES

Where test directions are provided, they are with respect to the direction of the roll. Cured 12 hrs at 70°C. Fabrics contained in these products are 2 layers of unidirectional E-glass fibres stitched together at +/-45° to each other.

PROPERTY	SYMBOL	UNIT	ST90 / XE300	ST90/XE603	ST90 / XE905	TEST STANDARD
Resin Content (nominal)	-	%	35	35	35	ASTM D 3171 Method II
Cured Ply Thickness	-	mm	0.25	0.48	0.72	ASTM D792
Fibre Volume Fraction	-	%	46	48	48	ASTM D 3171 Method II
+45° Tensile Strength*	X_T	MPa	497	546	589	ISO 527-4
+45° Tensile Modulus*	E_t	GPa	30	30	30	ISO 527-4
-45° Tensile Strength*	Y_T	MPa	517	501	569	ISO 527-4
-45° Tensile Modulus*	E_{T22}	GPa	30	29	30	ISO 527-4
+45° Compressive Strength*	X_C	MPa	675	742	683	SACMA SRM1-94
+45° Compressive Modulus*	E_c	GPa	30	31	30	SACMA SRM1-94
-45° Compressive Strength*	Y_C	MPa	608	741	615	SACMA SRM1-94
-45° Compressive Modulus*	E_{C22}	GPa	30	30	30	SACMA SRM1-94
+45° Flexural Strength	X_F	MPa	TBA	788	TBA	ISO 14125
+45 Flexural Modulus	E_{F11}	GPa	TBA	22	TBA	ISO 14125
-45° Flexural Strength	X_F	MPa	TBA	742	TBA	ISO 14125
-45 Flexural Modulus	E_{F11}	GPa	TBA	22	TBA	ISO 14125
ILSS	τ_M	MPa	62	61	52	ISO 14130

*Normalised to 55% fibre volume fraction

QUADRAXIAL (0/90/+/-45°) GLASS LAMINATE PROPERTIES

Where test directions are provided, they are with respect to the direction of the roll. Cured 12 hrs at 70°C. Fabrics contained in these products are 4 layers of unidirectional E-glass fibres stitched together at 0/90/+/-45° to each other.

PROPERTY	SYMBOL	UNIT	ST90 / QE600	ST90 / QE1230	TEST STANDARD
Resin Content (nominal)	-	%	33	41	ASTM D 3171 Method II
Cured Ply Thickness	-	mm	0.5	1.0	ASTM D792
Fibre Volume Fraction	-	%	46	46	ASTM D 3171 Method II
0° Tensile Strength*	X_T	MPa	487	407	ISO 527-4
0° Tensile Modulus*	E_t	GPa	24	24	ISO 527-4
90° Tensile Strength*	X_T	MPa	410	381	ISO 527-4
90° Tensile Modulus*	E_t	GPa	24	23	ISO 527-4
+45° Tensile Strength*	X_T	MPa	462	360	ISO 527-4
+45° Tensile Modulus*	E_t	GPa	25	23	ISO 527-4
-45° Tensile Strength*	Y_T	MPa	447	358	ISO 527-4
-45° Tensile Modulus*	E_{T22}	GPa	25	23	ISO 527-4
0° Compressive Strength*	X_C	MPa	498	490	SACMA SRM1-94
0° Compressive Modulus*	E_c	GPa	27	25	SACMA SRM1-94
90° Compressive Strength*	Y_C	MPa	474	427	SACMA SRM1-94
90° Compressive Modulus*	E_{C22}	GPa	25	24	SACMA SRM1-94
+45° Compressive Strength*	X_C	MPa	504	362	SACMA SRM1-94
+45° Compressive Modulus*	E_c	GPa	26	25	SACMA SRM1-94
-45° Compressive Strength*	Y_C	MPa	544	377	SACMA SRM1-94
-45° Compressive Modulus*	E_{C22}	GPa	26	24	SACMA SRM1-94
ILSS	τ_M	MPa	58	48	ISO 14130

*Normalised to 55% fibre volume fraction

WOVEN ROVINGS (0/90°) GLASS LAMINATE PROPERTIES

Where test directions are provided, they are with respect to the direction of the roll. Cured 12 hrs at 70°C. Fabrics contained in these products are four layers of unidirectional E-glass fibres stitched together at 0/90/+/-45° to each other.

PROPERTY	SYMBOL	UNIT	ST90 /WRE581T	ST90 / WRE850T	TEST STANDARD
Resin Content (nominal)	-	%	35	35	ASTM D 3171 Method II
Cured Ply Thickness	-	mm	0.45	0.67	ASTM D792
Fibre Volume Fraction	-	%	50	49	ASTM D 3171 Method II
0° Tensile Strength*	X_T	MPa	538	585	ISO 527-4
0° Tensile Modulus*	E_t	GPa	30.6	30	ISO 527-4
90° Tensile Strength*	X_T	MPa	579	565	ISO 527-4
90° Tensile Modulus*	E_t	GPa	29	31	ISO 527-4
0° Compressive Strength*	X_C	MPa	546	561	SACMA SRM1-94
0° Compressive Modulus*	E_c	GPa	31	30	SACMA SRM1-94
90° Compressive Strength*	Y_C	MPa	532	512	SACMA SRM1-94
90° Compressive Modulus*	E_{C22}	GPa	29	30	SACMA SRM1-94
0° Flexural Strength	X_F	MPa	740	739	ISO 14125
0° Flexural Modulus	E_{F11}	GPa	22	23	ISO 14125
ILSS	τ_M	MPa	61	56	ISO 14130

*Normalised to 55% fibre volume fraction

WOVEN GLASS FABRIC(0/90°) LAMINATE PROPERTIES

PROPERTY	SYMBOL	UNIT	ST90 /RE301	ST90 / RE499	TEST STANDARD
Resin Content (nominal)	-	%	35	35	ASTM D 3171 Method II
Cured Ply Thickness	-	mm	0.24	0.31	ASTM D792
Fibre Volume Fraction	-	%	48.5	48.6	ASTM D 3171 Method II
0° Tensile Strength*	X_T	MPa	532	585	ISO 527-4
0° Tensile Modulus*	E_t	GPa	32	31	ISO 527-4
90° Tensile Strength*	X_T	MPa	490	496	ISO 527-4
90° Tensile Modulus*	E_t	GPa	31	26	ISO 527-4
0° Compressive Strength*	X_C	MPa	555	593	SACMA SRM1-94
0° Compressive Modulus*	E_c	GPa	32	31	SACMA SRM1-94
90° Compressive Strength*	Y_C	MPa	500	466	SACMA SRM1-94
90° Compressive Modulus*	E_{C22}	GPa	30	29	SACMA SRM1-94
0° Flexural Strength	X_F	MPa	679	809	ISO 14125
0° Flexural Modulus	E_{F11}	GPa	25	23	ISO 14125
ILSS	τ_M	MPa	55	55	ISO 14130

*Normalised to 55% fibre volume fraction

NOTICE

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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.

TECHNICAL CONTACT INFORMATION

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