

ST 91FR

FIRE RETARDANT SPRINT™

- ▣ Fire retardant
- ▣ Capable of meeting ASTM E84 Class 1
- ▣ Capable of meeting BS 476 Part 7 Class 1
- ▣ Capable of meeting UL 94 V0
- ▣ Outstanding compressive properties
- ▣ Low void content vacuum bag processing
- ▣ Controlled flow
- ▣ Light tack - suitable for use in higher ambient temperatures
- ▣ Suitable for thick and thin sections
- ▣ Compatible with SF 80FR-OBL for improved performance

INTRODUCTION

ST 91FR is a fire-retardant, hot-melt, epoxy prepreg system that offers an extremely good balance of mechanical properties. Capable of meeting ASTM E84, UL 94 VO, BS 476 Part 7 Class 1.

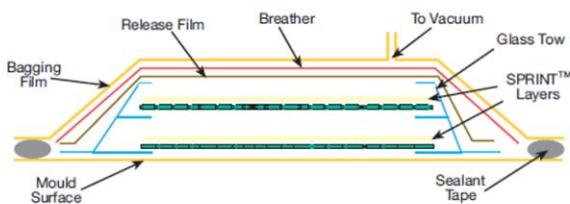
The system is ideal for structural components where self-extinguishing fire performance and high load bearing capability are desired. ST 91FR can be cured at 90°C, yet retains an out-life of up to 14 days at 21°C. With its 90 minute cure at 120°C, it is also suitable for the quick manufacture of parts, and is also used in the development of trial components.

INSTRUCTIONS FOR USE

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-plyed surface of a laminate, a nylon peel ply such as Tygavac Stitch Ply A, is strongly recommended. The peel ply is covered entirely with a non-perforated release film such as Tygavac WL3600 or a low bleed release film, such as WL3600RP2. The release film is then covered with breather material, such as Tygavac Econoweave 44W, 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 specification given later in this datasheet.

PLEASE NOTE:

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 SA80 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 SA80.

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.

CURING SCHEDULE

CURE ENVELOPE AND CURED PROPERTIES

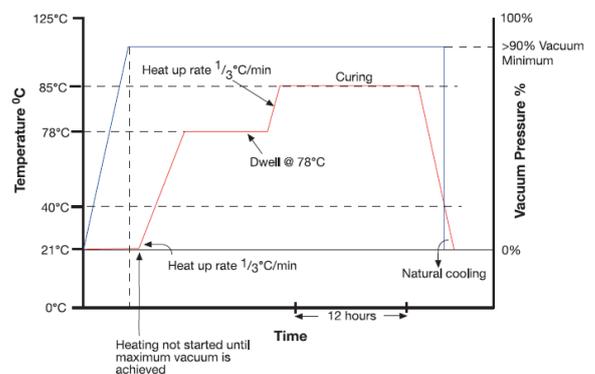
ST 91FR SPRINT™ has a relatively flexible cure envelope. The minimum cure is 10 hours at 85°C (185°F) and rapid cure is 60 minutes at 120°C (248°F). Other cure temperatures and times are given in the Working Properties section.

ST 91FR 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 40°C (104°F).

TYPICAL CURE PROFILES

The successful use of these cure schedules will depend on part size laminate construction. Heat up rate and dwell periods need to be tailored to take consideration of oven capacity, thermal mass of tool, laminate construction etc. Data in the table below is based on laminate temperatures, air temperatures may need to be higher. It is recommended that Gurit is contacted for further advice before utilising any of the suggested cure cycles.

Ultra Slow Cure Cycle single sided SPRINT™



PRODUCT INFORMATION

ST 91FR SPRINT™ is available in carbon, glass, aramid and hybrid formats, ranging in weight from 200g to 1600g. Please see price list for the latest product information. This product has also been evaluated in accordance with various fire test standards summarised below in the stated laminated configurations.

TEST STANDARD	DESCRIPTION / TYPE	RATING	DOCUMENT TYPE
UL 94 5th Edition	4 x plies ST91FR / YE905 / 34% RC	V-0	Full Report
BS476 Part 7 Surface Spread of Flame	4 x Plies ST91FR / YE905 / 34% RC	Class 1	Full Report
ASTM E84 - 07	3 x plies ST91FR / WRE581T / 37%	FSI = 25, SD = 195; Class 1 or A	Indicative Report
ASTM E84 - 07	3 x plies ST91FR / WRE581T / 37% 1 layer of 15mm G-PET75 FR 3 x plies ST91FR / WRE581T / 37%	FSI = 65, SD = 300; Class 2 or B	Indicative Report

COMPATIBLE SURFACE FILMS

SPRINT™ can be used in combination with a variety of Gurit surfacing materials, suitable for many different applications. Please see price list for latest product information.

COMPATIBLE ADHESIVE FILMS

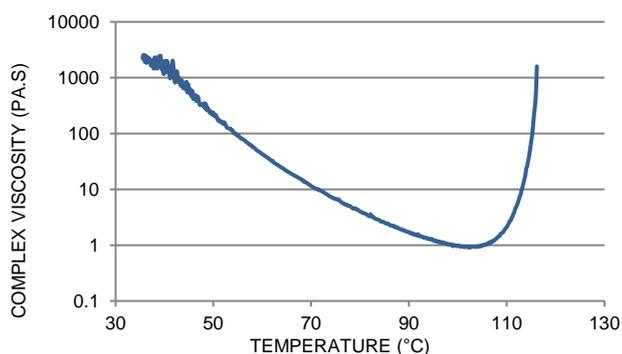
Gurit has a range of SA 80 adhesive films which can be used with all SPRINT™ materials. These are supplied with a supporting medium in 250g and 400g film weights.

PREPREG PROPERTIES

RHEOLOGY DATA

ST 91FR resin viscosity profile conducted at 1°C (1.8°F)/minute.

PROPERTY	VALUE	
Minimum Viscosity	0.91 Pa.s	9.1 P
Temperature at Minimum Viscosity	102 °C	216°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	14

The self-impregnation of the SPRINT™ can compromise its ability to generate high quality laminates as the air breathing properties decrease after a certain length of time at ambient temperature. Self-impregnation will increase the tack and reduce the drape of the material. While self-impregnation will vary from product to product, most SPRINT™ materials stored at ambient temperatures will self-impregnate within approximately two weeks. It is recommended that ambient temperature storage is below 22°C (71°F) as higher storage temperatures will induce premature self-impregnation. 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 product SDS for up to date information specific to this product.

MINIMUM CURE TIME & TEMPERATURE

ST 91FR SPRINT™ using vacuum bag processing with recommended minimum cure of 10 hours at 85°C (185°F)

PROPERTY	85°C CURE CYCLE	120°C CURE CYCLE
Processing Method	Vacuum Bag	
Typical Ramp Rate	0.5°C (0.9°F) per minute	
Cure Temperature	85°C (185°F)	120°C (248°F)
Cure Time	10 hours	90 minutes
Cure Pressure	-1 (bar)	
Dry Tg ₁ (DMA)	110°C (230°F)	130°C (266°F)

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

LAMINATE PROPERTIES

Where possible properties presented are multiple batch data and witnessed by a third party surveyor on a standard fibre type. Customers with specific requirements should contact Gurit technical support who can recommend suitable fibres and formats.

MULTIAXIAL LAMINATE PROPERTIES

Cured using standard processing techniques and standard cure of 10 hours at 85°C (185°F). Where test directions are provided they are with respect to the warp direction of the roll.

PROPERTY	SYMBOL	UNIT	XC411 / ST91FR / XC411	TEST STANDARD
Resin Content	-	%	43	ASTM D 3171 Method II
Cured Ply Thickness	-	mm	0.43	ASTM D792
Fibre Volume Fraction	-	%	52.8	ASTM D 3171 Method II
±45° Tensile Strength*	X_T	MPa	1090	ISO 527-4
±45° Tensile Modulus*	E_t	GPa	63	ISO 527-4
±45° Compressive Strength*	X_C	MPa	606	SACMA SRM1-94
±45° Compressive Modulus*	E_c	GPa	61	SACMA SRM1-94
±45° ILSS	τ_M	MPa	50	ISO 14130

*Normalised to 55% fibre volume fraction

NOTICE

All advice, instruction or recommendation is given in good faith but the selling Gurit entity (the Company) only warrants that advice in writing is given with reasonable skill and care. No further duty or responsibility is accepted by the Company. All advice is given subject to the terms and conditions of sale (the Conditions) which are available on request from the Company or may be viewed at Gurit's Website: www.gurit.com/terms-and-conditions.aspx

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

For all other enquiries such as technical queries:

Telephone + 44 1983 828000 (08:30 – 17:00 GMT)
Email technical.support@gurit.com

24-HOUR CHEMICAL EMERGENCY NUMBER

For advice on chemical emergencies, spillages, fires or exposures:

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